JOINT EXTERNAL EVALUATION OF IHR CORE CAPACITIES

of the
REPUBLIC OF THE SUDAN

Mission report:
9–13 October 2016

World Health Organization

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ACKNOWLEDGEMENTS

Contents

Abbreviations

AFP	acute flaccid paralysis
AMR	antimicrobial resistance
CCHF	Crimean-Congo haemorrhagic fever
CHW	community health worker
EET	external evaluation team
EOC	emergency operations centre
EPI	Expanded Programme for Immunization
FAO	Food and Agriculture Organization of the United Nations
EWARS	Early Warning, Alert and Response System
FETP	Field Epidemiology Training Programme
FMoH	Federal Ministry of Health
GLASS	Global Antimicrobial Resistance Surveillance System
GIS	Geographic Information System
IDSR	integrated disease surveillance and response
IEC	information, education and communication
IHR	International Health Regulations (2005)
ISO	International Organization for Standardization
JEE	Joint External Evaluation of the IHR
MenA	meningococcal A conjugate vaccine
MCV1	measles containing vaccine 1st dose
MERS-CoV	Middle East respiratory syndrome coronavirus
MoAF	Ministry of Animal Resources and Fisheries
MoH	Ministry of Health
NFP	National Focal Point
NPHL	National Public Health Laboratory
NSS	National Surveillance System
OIE	World Organisation for Animal Health
PHEIC	public health emergency of international concern
PoE	points of entry
RRT	rapid response team
SMoH	State Ministry of Health
RVF	Rift Valley fever
SAICM	Strategic Approach to International Chemicals Management
SARS	severe acute respiratory syndrome
SNRRA	Sudanese Nuclear and Radiological Regulatory Authority
SOP	standard operating procedures
SPHL	state public health laboratory
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Executive summary

A Joint External Evaluation (JEE) of the core capacities of the Republic of the Sudan to meet the health security requirements of the 19 technical areas of the International Health Regulations (2005)(IHR) took place on 9–13 October 2016. Using the World Health Organization (WHO) IHR JEE tool, an international team of experts worked together with their Sudanese peers to conduct the assessment through discussions and site visits. This report presents the jointly developed recommendations and priority actions that resulted from these discussions.

Major findings

Two issues were found to cut across the JEE technical areas:

1. The high staff turnover (or brain-drain) affects all areas of work that requires a skilled workforce. For multiple reasons (but mainly financial) highly skilled staff such as physicians, nurses, public health administrators and others migrate to other countries in search of better professional opportunities.

2. The wide cross-sector cooperation and coordination of responses to different public health events including emergencies seem well established and operationally functional, resulting in rapid and effective actions. This should encourage Sudan to comply fully with notifying potential public health emergencies of international concern under the IHR, as the international community will recognize the efforts the country takes and may be able to provide additional support.

Specific findings

The major specific findings on Sudan's IHR capacity and capability are summarized as follows.

- An assessment of the 27 laws relevant to IHR, carried out by the Sub-National Committee in 2014, found that most were in line with the IHR. Four Acts need to be amended to ensure full and effective compliance with the IHR provisions. However, these laws do not appear to conflict with or prevent implementation of the IHR, and the amendments are under way.

- There is a strong tiered system of supporting committees: the multisectoral Higher Committee for IHR includes undersecretaries from different ministries and provides strategic level guidance. An IHR Technical Committee has technical focal points from different ministries. Four subcommittees addressing chemical, radionuclear events, legislation and points of entry (PoE) support the Technical Committee to implement the IHR.

- The IHR National Focal Point (NFP) operates at a sufficiently high level of government, and in the immediate supervisory position of the Emergency Operations Centre (EOC) and different technical departments of the Fedral Ministry of Health (FMoH). This allows rapid access to information and efficient coordination of multisectoral engagement in public health events and emergencies.

- Sudan has established a national committee and working groups to cover specific technical areas related to antimicrobial resistance (AMR). Some activities have started, pending a national AMR action plan.

- Zoonoses are of great public health concern due to the high cross-border movement of people, livestock and wildlife and other means of disease emergence and spread. Sudan is experiencing both internal and neighbouring country instability, unrest and conflict. This can trigger mass mobility of people and animals. Animal quarantine is established between States and at PoE; however, the movement of animals is not systematically controlled. While Sudan's "One Health" concept note is awaiting approval, its sharing of information and joint outbreak investigation and response for zoonotic events is commendable, and has helped to trace the source of infections and reduce the need for containment and resources.

- The Environmental and Food Control Department acts as the national regulatory body for food control and safety. The surveillance system for foodborne diseases is weak, as is coordination among stakeholders.

- A Laboratory Working Group has drafted a national policy on biosafety and biosecurity. Licensing is only mandatory for private human and animal medical laboratories, and biosafety and biosecurity are not part of the licensing process. There is no national record or inventory of pathogens within facilities that store or process dangerous pathogens and toxins.

- The national EPI programme is the most successful primary health care intervention in the country. Immunization is mandatory in all target populations, and vaccination cards are mandatory for school entry. Vaccines are provided free of charge to all target populations living in the country regardless of their nationality, including refugees. A strong vaccine preventable disease surveillance system is in place, which has reached the recommended performance standards. Efforts are needed to sustain these achievements.

- Sudan's central laboratory capacity is good in the public sector, but a well-defined national laboratory network for both animal and human health is needed from health facility to effective referral level.

- While several public health surveillance systems exist, only two have multi-disease surveillance. Many carry out specific vertical programmes such as noncommunicable diseases, environmental health, or reproductive health. Such siloed surveillance systems have their own "sentinel sites" based on their geographical distribution, with different data collected using disease-specific data reporting forms. An integrated disease surveillance and response (IDSR) plan of action has been developed to streamline surveillance activities and save resources.

- Sudan is not part of any field epidemiology training programme or alternative long-term training programme. However, some staff have had field epidemiology training outside the country, and short courses on outbreak investigation and response to epidemics are available. The strategy for human resources for health is partially implemented, but low salaries and the rapid growth of a private sector for health training and employment limit the ability to implement it well.

- The National Civil Defence Commission (NCDC) developed the overarching national plan for emergency preparedness and response in the country. The National Committee for Emergency Preparedness and Response, headed by the Ministry of Interior, operates under the Supreme Council for Civil Defence. In addition, a permanent unit within the FMoH caters for all activities of emergency planning and preparedness related to health, supported by a public health plan and standard operating procedures for all hazards. High staff turnover has recently compromised activities. An annual national risk assessment is conducted under the NCDC by all ministries and relevant stakeholders. Risks and their sources are identified and mapped for each state, and the public health preparedness and response plan updated.

- An EOC exists within the FMoH at the federal and some state levels. The EOC has appropriate physical structure to augment strategic functions in a response to a medical emergency at the state level. The Incident Commander is the state minister or the federal undersecretary. Essential communication equipment is available for communication between EOCs, but appropriate logistic support is not robust.

- The Government has national legislation that allows the public health sector to request the support of the security sector to implement public health measures. Several live events in the country demonstrated the capacity of the public health sector to call for the support of the security sector to implement public health measures. The security sector has provided the required support in terms of logistics, access and security to public health officers to implement public health measures.

- Sudan's experience in facing medical emergencies has built its capacity to send medical teams abroad and receive expertise and supplies from other countries. The plan for sending and receiving medical countermeasures and personnel was revised in 2015 in line with response and recovery experiences. The national policy is currently at the parliamentary approval phase.

- A National Risk Communication Plan was endorsed in 2016 by FMoH, achieving a critical IHR milestone to align health communication efforts across Sudan's three levels of government and between sectors. This, combined with the scale-up of a Health Promotion Directorate in charge of risk communications and community engagement has strengthened Sudan's risk communications platform. Limited human and financial resources are a constraint to successful risk communication activities. The team also requires extra risk communication training, and appropriate technologies to work efficiently and credibly with other sectors and partners during public health and humanitarian emergencies.

- Sudan has four international airports, two ports and seven ground crossings. Of these border crossings, three have been designated PoE for IHR implementation. Several IHR requirements have been implemented at the designated airport and port. Designating additional PoEs based on a risk assessment and having a plan of action to meet IHR requirements at the newly designated PoE is needed.

- Sudan is a large user of chemicals, particularly in the agricultural and health sectors, but manage them in a piecemeal fashion. While basic legislation is largely in place to respond to events of chemical origin, no complementary regulations exist to control chemicals and hazardous substances produced intentionally or unintentionally. Pharmaceuticals are specifically regulated but, apart from pesticides, existing legal measures do not address the whole life cycle of chemicals. There is inadequate legislation for the control of toxic chemical waste. The national chemicals management profile needs to be regularly updated. A chemicals safety policy and national strategy and action plan for implementing the Strategic Approach to International Chemicals Management await comprehensive implementation.

- Sudan is in the process of getting its legislative and organizational infrastructure in place for managing radiological emergencies. The Nuclear and Radiation Activities Regulatory Control Bill is expected to be passed by Parliament in 2016. The responsibilities of the Sudanese Nuclear and Radiological Regulatory Authority (SNRRA) will be further delineated by this Bill. Sudan is party to the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency as well as a number of other important conventions and treaties on the safe and peaceful use of nuclear energy. SNRRA is the focal point for the WHO Radiological Emergency Medical Preparedness and Assistance Network to which it became a member in 2014.

Introduction

This evaluation was a joint assessment of International Health Regulations (IHR) core capacities of the Republic of the Sudan using the World Health Organization (WHO) IHR Joint External Evaluation (JEE) tool. A multisectoral international External Evaluation Team (EET) consisting of individuals selected on the basis of their recognized technical expertise from a number of countries, and advisors representing international organizations, conducted the assessment. The mission took place from 9 to 13 October 2016 and comprised discussions and site visits. This report presents the jointly developed recommendations and priority actions that resulted from discussions between the EET experts and their Sudanese peers representing all sectors relevant to the 19 technical areas of theJEE tool.

Sudan is a presidential representative democratic federal republic of 18 partly autonomous states. It is the third largest country in Africa with a population of over 30 million. The capital, Khartoum has a population of 5.2 million. Sudan is an ethnically diverse country with close to 600 different groups, speaking over 400 languages. Sudan's history goes back to the pharaonic times. The main religion is Islam (97% of population) and Arabic is widely spoken.

The country has a sea border with the Red Sea of 853 km, and has long land borders with Egypt, Eritrea, Ethiopia, South Sudan, the Central African Republic, Chad, and Libya. The Blue and White Nile rivers meet in Khartoum to form the River Nile, which flows northwards through Egypt to the Mediterranean Sea. The central and northern parts have extremely dry desert areas such as the Nubian Desert and the Bayuda Desert; in the south there are swamps and rainforest. Sudan's rainy season lasts for about three months (July to September) in the north, and up to six months (June to November) in the south.

Sudan's governance and health system operate on three levels of a federal system. The health system is coordinated by the Health Sector Coordination Council (NHSCC). The FMoH has a leading role in policy and stewardship. Services are provided by the public and private sectors (for profit and not-for-profit). The health system is organized at primary, secondary and tertiary levels, and considerable efforts are exerted in a referral system. At the community level, care is provided by community health workers and village midwives. According to official figures, 93% of the population has access to primary health care and 60% of health facilities offer the main components of the primary health care package. However, only 32.9% have improved sanitation services.

Health financing is based on a mix of publicly funded, out-of-pocket and prepayment mechanisms. While there is a lack of coordination between multiple financing sources, public funding has risen considerably and amounts to 9% of public expenditure. Public spending equals 6% of gross domestic product (GDP), of which 75% is out-of-pocket. Per capita public spending is US$ 125, but only 15% of public health expenditure is on primary health care.

The ratio of medical doctors, nurses and midwives is 1.23 per 1000 population, whereas the doctors to nurses ratio is 1:1.4. Sixty per cent of the health workforce live in urban settings. A serious challenge for the health sector is the high turnover of the health workforce. Experienced staff tend to migrate for better work terms and compensation into more affluent neighbouring countries.

Sudan is under sanctions by a number of countries, which affects imports and may have affected its ability to mount adequate responses to some infectious disease outbreaks and humanitarian crises.

Sudan scores

Capacities	Indicators	Score
National legislation, policy and financing	P.1.1 Legislation, laws, regulations, administrative requirements, policies or other government instruments in place are sufficient for implementation of International Health Regulations (IHR) (2005)	3
	P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with IHR (2005)	2
IHR coordination, communication and advocacy	P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR	3
Antimicrobial resistance	P.3.1 Antimicrobial resistance detection	1
	P.3.2 Surveillance of infections caused by resistant pathogens	2
	P.3.3 Health care-associated infection prevention and control programmes	2
	P.3.4 Antimicrobial stewardship activities	1
Zoonotic diseases	P.4.1 Surveillance systems are in place for priority zoonotic diseases/pathogens	4
	P.4.2 Veterinary or animal health workforce	4
	P.4.3 Mechanisms for responding to zoonoses and potential zoonoses are established and functional	4
Food safety	P.5.1 Mechanisms are established and functioning for detecting and responding to food-borne disease and food contamination	2
Biosafety and biosecurity	P.6.1 Whole-of-government biosafety and biosecurity system is in place for human, animal and agriculture facilities	2
	P.6.2 Biosafety and biosecurity training and practices	2
Immunization	P.7.1 Vaccine coverage (measles) as part of national programme	3
	P.7.2 National vaccine access and delivery	5
National laboratory system	D.1.1 Laboratory testing for detection of priority diseases	4
	D.1.2 Specimen referral and transport system	3
	D.1.3 Effective modern point-of-care and laboratory-based diagnostics	2
	D.1.4 Laboratory quality system	2
Real-time surveillance	D.2.1 Indicator- and event-based surveillance systems	3
	D.2.2 Interoperable, interconnected, electronic real-time reporting system	1
	D.2.3 Analysis of surveillance data	3
	D.2.4 Syndromic surveillance systems	4
Reporting	D.3.1 System for efficient reporting to WHO, FAO, and OIE	2
	D.3.2 Reporting network and protocols in country	3
Workforce development	D.4.1 Human resources are available to implement IHR core capacity requirements	2
	D.4.2 Field epidemiology training programme or other applied epidemiology training programme is in place	2
	D.4.3 Workforce strategy	2

Preparedness	R.1.1 Multi-hazard national public health emergency preparedness and response plan is developed and implemented	3
	R.1.2 Priority public health risks and resources are mapped and utilized	4
Emergency response operations	R.2.1 Capacity to activate emergency operations	2
	R.2.2 Emergency operations centre operating procedures and plans	3
	R.2.3 Emergency operations programme	4
	R.2.4 Case management procedures are implemented for IHR-relevant hazards	2
Linking public health and security authorities	R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) are linked during a suspect or confirmed biological event	5
Medical countermeasures and personnel deployment	R.4.1 System is in place for sending and receiving medical countermeasures during a public health emergency	5
	R.4.2 System is in place for sending and receiving health personnel during a public health emergency	5
Risk communication	R.5.1 Risk communication systems (plans, mechanisms, etc.)	2
	R.5.2 Internal and partner communication and coordination	3
	R.5.3 Public communication	3
	R.5.4 Communication engagement with affected communities	3
	R.5.5 Dynamic listening and rumour management	2
Points of entry	PoE.1 Routine capacities are established at points of entry	3
	PoE.2 Effective public health response at points of entry	2
Chemical events	CE.1 Mechanisms are established and functioning for detecting and responding to chemical events or emergencies	1
	CE.2 Enabling environment is in place for management of chemical events	2
Radiation emergencies	RE.1 Mechanisms are established and functioning for detecting and responding to radiological and nuclear emergencies	2
	RE.2 Enabling environment is in place for management of radiation emergencies	3

Note on scoring of technical areas of the JEE tool

The JEE process is a peer-to-peer review and a collaborative effort between host country experts and JEE team members. In completing the self-evaluation, the first step in the JEE process, and as part of preparing for an external evaluation, host countries are asked to focus on providing information on their capabilities based on the indicators and technical questions included in the JEE tool.

The host country may score their self-evaluation or propose a score during the onsite visit with the JEE team. The entire external evaluation, including the discussions around the score, strengths/best practices, the areas that need strengthening, challenges, and the priority actions, is done in a collaborative manner, with the JEE team members and host country experts seeking agreement.

Should there be significant and irreconcilable disagreement between the JEE team members and the host country experts, or among the JEE team, or among the host country experts, the JEE team lead will decide on the final score and this will be noted in the final report, along with the justification for each party's position.

PREVENT

National legislation, policy and financing

Introduction

The IHR provides obligations and rights for States Parties. Whether existing or new, implementing legislation may serve to institutionalize and strengthen the role of IHR (2005) and operations within the State Party. It can also facilitate coordination among the different entities involved in their implementation. See detailed guidance on national legislation for IHR (2005) implementation is available at www.who.int/ihr/legal_issues/legislation/en/index.html.

> **Target**
>
> *States Parties should have an adequate legal framework to support and enable the implementation of all of their obligations and rights to comply with and implement the IHR (2005). In some States Parties, implementation of the IHR (2005) may require new or modified legislation. Even where new or revised legislation may not be specifically required under the State Party's legal system, States may still choose to revise some legislation and regulations or develop other legal instruments in order to facilitate their implementation in a more efficient, effective or beneficial manner.*

Sudan level of capabilities

Sudan has an extensive body of laws in most relevant sectors that facilitates the implementation of IHR; however efforts are needed to ensure full and effective implementation of existing legislation.

Sudan has made considerable efforts to implement the IHR. The Public Health National Act was reviewed in 2009 to incorporate the IHR. Furthermore, Sudan has established institutions to enforce the regulations: the Higher National Committee ensures the implementation of IHR and a Sub-National Committee reviews the legislation of all relevant sectors. The Sub-National Committee is composed of legal advisors from the Ministry of Justice and the Federal Ministry of Health (FMoH), IHR focal points in the FMoH and the Ministry of Justice as well as a representative from the High Council for Environment and National Resources.

An assessment of 27 laws relevant to IHR was carried out by the Sub-National Committee in 2014. The Committee found that most laws are in line with the IHR. Acts that need to be amended to ensure full and effective compliance with IHR provisions are the Public Health National Act 2008, the Health Quarantine Act 1974 and legislation related to radiation and chemical events. While amendments are needed, these laws do not appear to conflict with or prevent implementation of the IHR, and the amendments are currently under way: the draft Public Health Act and Health Quarantine Act are under review in the legislation department of the FMoH and the law on radiation is being reviewed by the National Assembly. It is expected that these amendments will be adopted in the near future. On the other hand, the draft law on chemical events still needs to be reviewed by the technical experts in the relevant ministries; thus it may take a considerable amount of time before it is adopted and implemented.

Numerous legal instruments such as regulations, ministerial decrees and other administrative measures exist within the legal system and can provide the necessary legal foundation for IHR implementation, obviating the need for lengthy parliamentary approval.

While progress has been made to improve multisectoral coordination, further efforts are needed to strengthen communication between the sectors involved in IHR. Sudan is in the process of building a

stronger regulatory system to improve coordination and communication in some sectors, including a National Council for Chemical and Hazardous Substances once the draft law is enforced.

Recommendations for priority actions

- Adopt any revised legislation including the draft Public Health Act, the draft Quarantine Act and the draft law related to radiation emergencies.

- Update existing cross-border agreements to enhance surveillance and response.

- Draft a ministerial decree to establish a temporary body (National Authority for the Prohibition of Chemical Weapons) responsible for coordination and cooperation on chemical matters until the related draft Act is adopted and implemented.

Indicators and scores

P.1.1 Legislation, laws, regulations, administrative requirements, policies or other government instruments in place are sufficient for implementation of International Health Regulations (IHR) (2005)

Score 3: Developed capacity. An assessment of relevant legislation was carried out in most areas of the IHR in 2014. Implementation of the recommendations following that assessment is in progress.

Strengths and best practices
- Sudan is committed to implementing the IHR; in addition to this JEE; a legislative assessment covering most IHR-relevant areas was carried out in 2014.

- The Higher National Committee for IHR implementation and the Sub-National Legal Committee support efforts to implement the IHR.

- A legal framework exists for most packages, with 27 laws directly or indirectly involved with IHR.

- A legal department exists within the FMoH and the Ministry of Justice, and legal advisors are present in most other relevant ministries.

Areas that need strengthening/ challenges
- Revised legislation should be adopted and implemented.

- Multisectoral coordination needs to be strengthened between stakeholders under the "One Health" umbrella approach.

P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with the IHR (2005)

Score 2: Limited capacity. The effective implementation of recommendations following the legislative and regulatory assessment will enable Sudan to reach a higher level for this indicator.

Strengths and best practices
- The IHR is entrusted to FMoH and the Undersecretary has been designated as the National Focal Point.

- An assessment of the laws and regulatory measures in most relevant sectors was carried out in 2014. Adjustment needs identified include a new Public Health Act and Quarantine Act.

- Sudan is building a stronger regulatory system to improve coordination and communication in some sectors relevant to IHR, including establishing a national body to deal with chemical events.

Areas that need strengthening/ challenges

- Draft Acts and policies need to be approved by Parliament and other relevant authorities, and implemented.

- Available legislation, regulations, and policies should continue to be regularly evaluated to facilitate full IHR implementation.

IHR coordination, communication and advocacy

Introduction

The effective implementation of the IHR requires multisectoral, multidisciplinary approaches through national partnerships for efficient and alert response systems. Coordination of nationwide resources, including the designation of an IHR NFP, which serves as a national centre for IHR communications, is a key requisite for IHR implementation.

Target

The national IHR focal point to be accessible at all times to communicate with the WHO regional IHR contact points and with all relevant sectors and other stakeholders in the country. States Parties to provide WHO with contact details of their national IHR focal points, as well as continuously update and annually confirm them.

Sudan level of capabilities

The National IHR Focal Point for Sudan functions at a high level of government and is resident in the Office of the Undersecretary of the FMoH. The IHR NFP has full authority to communicate IHR-related information to WHO.

There is a strong tiered system of supporting committees: the multisectoral Higher Committee for IHR consists of undersecretaries from different ministries (Agriculture, Animal Resources, Aviation, Civil Defence, Defence, Environment and Urban Development, Finance, Foreign Affairs, Health, Higher Education, Interior, Industry, and Justice). The committee provides strategic guidance and convenes every three months. A Technical Committee meets monthly and consists of technical focal points from different ministries. Four subcommittees address chemical, radionuclear, legislation and points of entry issues.

The IHR NFP is also in the immediate supervisory position of the Emergency Operations Centre (EOC) and different technical departments of the FMoH. This allows for efficient coordination of multisectoral engagement in emergency and crisis situations, which has been demonstrated during many infectious disease outbreaks.

At the time of the JEE, the IHR NFP and associated departments were responding to and managing an outbreak of acute watery diarrhoea. No formal notification of the outbreak was made to WHO under the IHR protocol, although WHO was made aware of the situation. This is unfortunate, as the health security system is clearly capable of responding effectively to outbreaks, even of severe types of disease. If this could be demonstrated, more international support may be generated.

Recommendations for priority actions

- Evaluate the functions of the IHR NFP and the mechanism for multisectoral coordination.
- Review and update the guidelines of the IHR NFP and IHR committees in relation to the current situation.
- Develop a plan of action on IHR implementation with the involvement of all relevant sectors.
- Enhance IHR advocacy activities to overcome the high turnover among personnel.

Indicators and scores

P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR

Score 3: Developed capacity. A system is in place for coordination between the different sectors. Terms of reference for the IHR NFP and IHR committees are in place. The functionality of the Higher Committee has been tested in real-time events. The capacity of the Technical Committee and sub-committees have also been tested in assessing gaps and recommending measures to improve IHR implementation in related areas. However, no notification of a potential public health emergency of international concern (PHEIC) has ever been made from Sudan to WHO under the IHR.

Strengths and best practices

- The existing Higher and Technical Committees enable smooth communication with all sectors.
- IHR NFP guidelines exist with clear roles and responsibilities.

Areas that need strengthening/ challenges

- Personnel turnover is high.
- The threshold for IHR notification may need to be lowered.

PREVENT

Antimicrobial resistance

Introduction

Bacteria and other microbes evolve in response to their environment and inevitably develop mechanisms to resist being killed by antimicrobial agents. For many decades, the problem was manageable as the growth of resistance was slow and the pharmaceutical industry continued to create new antibiotics.

Over the past decade, however, this problem has become a crisis. Antimicrobial resistance (AMR) is evolving at an alarming rate and is outpacing the development of new countermeasures capable of thwarting infections in humans. This situation threatens patient care, economic growth, public health, agriculture, economic security and national security.

Target

Support work coordinated by the FAO, OIE and WHO for developing an integrated and global package of activities to combat antimicrobial resistance, spanning human, animal, agricultural, food and environmental aspects (i.e. a One-health approach). This would include: (i) having a national comprehensive plan for each country to combat antimicrobial resistance; (ii) strengthening of surveillance and laboratory capacity at the national and international levels following agreed upon international standards developed in the framework of the Global Action Plan; and (iii) improved conservation of existing treatments and collaboration to support the sustainable development of new antibiotics, alternative treatments, preventive measures and rapid, point-of-care diagnostics with systems to preserve new antibiotics.

Sudan level of capabilities

In order to combat AMR, Sudan has established a national multidisciplinary and multisectoral committee composed of experts in clinical microbiology, pharmacy, infection prevention and control (IPC), and veterinary medicine; as well as representatives from the FMoH, Ministry of Agriculture, and the WHO Country Office. It has also established working groups with identified people to cover the specific technical areas. While some activities have already started, a National Action Plan on AMR is yet to be drafted.

Three human laboratories in the country – the National Public Health Laboratory (NPHL), the laboratory at Soba Hospital and another at Omdurman Hospital, all located in Khartoum State – have the capacity to detect (using breakpoints of the Clinical and Laboratory Standards Institute) and report all seven priority AMR pathogens listed by WHO[1] plus Mycobacterium tuberculosis. The Central Veterinary Research Laboratory, located in Soba, is also capable of detecting all relevant AMR pathogens.

The NPHL and the Central Veterinary Research Laboratory are the designated national referral laboratories for AMR.

As reports on AMR from Sudan are scarce, a roadmap has been developed to establish a national AMR surveillance system and communicate those data to the Global Antimicrobial Resistance Surveillance System (GLASS). AMR surveillance will start with Khartoum State as a model, and may then be expanded to other states. Currently there is no routine AMR surveillance in animals, only active surveillance in the context of outbreaks.

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[1] Escherischa coli, Klebsiella pneumoniae, Neisseria gonorrhoeae, Staphylococcus aureus, S. pneumoniae, Salmonella spp., and Shigella spp.

With regard to infection control, Sudan has drafted a National Infection Prevention and Control (IPC) plan, distributed a National IPC Manual, and established an Infection Control Unit as part of *the FMoH* (National Infection Control Committee). While some health facilities have an IPC programme, and Soba University pharmacy makes its own hand sanitizer, implementation of IPC in all health-care facilities at country level is a concern. In collaboration with the Arab Institute for Continuous Professional Development in Egypt, training of trainers and workshops on IPC have been organized.

As the country has no postgraduate programme for IPC/Antibiotic Stewardship, clinical microbiologists and pharmacists are taking the lead.

A National Medicines Policy was adopted in 2014, and the National Standard Treatment Guidelines (2014) cover infectious diseases such as diarrhoea, tonsillitis, bacterial meningitis, community-acquired pneumonia in adults, pelvic inflammatory disease, lower urinary tract infection, otitis media, typhoid fever, cellulitis, as well as infectious diseases of epidemiologic concern. An Antimicrobial Policy for Khartoum State was approved in 2014.

Sudan's National Essential Medicines List is updated regularly by an assigned committee. However, essential antibiotics on the list, such as cloxacillin, are not accessible in the country, driving inappropriate prescription of other antibiotics. A similar situation exists for the treatment of infections caused by multidrug-resistant pathogens where inappropriate medicines are used in place of those on the list. For gram-negative bacteria, the options are limited. Efforts are being made by members of the National AMR Committee in collaboration with the National Medicines and Poisons Board to solve this problem as soon as possible.

Antibiotics for use in humans are easy to acquire without prescription, despite a law to regulate their administration (Medicine and Poisoning Law, 2012). Antibiotics are also used illegally without prescription in animals, including for growth promotion. According to Eltayb et al.,[2] more than half the farmers are uneducated and, while the majority declared using antibiotics for treatment and prevention, only 5% stated using them for growth promotion. Quinolone antibiotics were being used both for sick and healthy animals. Multidrug-resistant Salmonella serovars were isolated from chickens and other animals and foods (Elmadiena et al., 2013).

Awareness campaigns on AMR, highlighting the collateral damage caused by inappropriate consumption and prescription of antibiotics, are mandatory to combat AMR, as the whole community is involved, including patients, farmers, prescribers and pharmacists.

Recommendations for priority actions

- Develop a National AMR plan, ensuring alignment with the 2015 Global Action Plan on AMR, covering all core sectors.
- Implement AMR surveillance systems in humans and animals.
- Implement the National IPC plan.
- Develop a training plan on IPC (short- and long-term courses, and as part of the curriculum for undergraduate and postgraduate studies).
- Develop awareness programmes on AMR for different stakeholders.

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2   Eltayb A, Barakat S, Marrone G, Shaddad S, Stålsby Lundborg C. Antibiotic Use and Resistance in Animal Farming: A Quantitative and Qualitative Study on Knowledge and Practices among Farmers in Khartoum, Sudan. Zoonoses Public Health. 2012;59(5):330–8.

PREVENT

Indicators and scores

P.3.1 Antimicrobial resistance detection

Score 1: No capacity.

Strengths and best practices

Sudan's capacity exceeds the score of 1 for indicator P.3.1 in the following ways:

- A national multidisciplinary and multisectoral committee to combat AMR has been established.
- Three human laboratories in the country (all located in Khartoum State) have the capacity to detect and report all seven priority AMR pathogens listed by WHO.
- The Central Veterinary Research Laboratory also has the capacity to detect all relevant AMR pathogens.
- The NPHL and the Central Veterinary Research Laboratory are the designated national referral labatories for AMR.

Areas that need strengthening/ challenges

- No national plan for detection and reporting of priority AMR pathogens has been approved.
- The capacity for detection and reporting of priority AMR pathogens outside Khartoum State needs to be developed.

P.3.2 Surveillance of infections caused by resistant pathogens

Score 2: Limited capacity.

Strengths and best practices

- A roadmap has been developed to establish a national AMR surveillance system and communicate data to GLASS.

Areas that need strengthening/ challenges

- To fully meet the capacity requirements for score 2 for indicator P.3.2, AMR surveillance in animals should be included in the National Plan.
- For national AMR surveillance, GLASS has not yet been implemented.

P.3.3 Healthcare associated infection prevention and control programmes

Score 2: Limited capacity.

Strengths and best practices

- Sudan has drafted an IPC plan, distributed a National IPC Manual, and established an Infection Control Unit as part of the FMoH.
- Some health facilities have an IPC programme.
- Soba University pharmacy makes its own hand sanitizers.
- In collaboration with the Arab Institute for Continuous Professional Development in Egypt, training of trainers and workshops on IPC have been organized.

Areas that need strengthening/ challenges

- At the country level, implementation of IPC in all health-care facilities is a concern.

- There is no national training plan on IPC.

P.3.4 Antimicrobial stewardship activities

Score 1: No capacity.

Strengths and best practices

Sudan's capacity exceeds the score of 1 for indicator P.3.4 in the following ways:

- In 2014, a National Medicines Policy, Sudan National Standard Treatment Guidelines, Antimicrobial Policy for Khartoum State and a National Essential Medicines List were developed.

- Legislation (Medicine and Poisoning Law 2012) makes prescription of antibiotics in humans and animals mandatory.

Areas that need strengthening/ challenges

- The non-availability of some antibiotics on the Essential Medicine List needs to be remedied.

- Antibiotics for use in humans and animals are easy to acquire without prescription.

- Awareness of AMR is lacking.

Zoonotic diseases

Introduction

Zoonotic diseases are communicable diseases and microbes spreading between animals and humans caused by bacteria, viruses, parasites, and fungi that are carried by animals; insects or inanimate vectors may be needed to transfer the microbe. About 75% of recently emerging infectious diseases affecting humans are of animal origin while approximately 60% of all human pathogens are zoonotic. In general, zoonotic disease emergence are facilitated by factors such as changes in ecology, microbial adaptation, human demographics and behaviour, international travel and trade, intensity of agricultural practices, technology and industry.

Target

Adopt measured behaviours, policies and/or practices that minimize the transmission of zoonotic diseases from animals into human populations.

Sudan level of capabilities

Sudan's priority zoonoses are Rift Valley fever (RVF), Crimean-Congo haemorrhagic fever (CCHF), brucellosis, rabies, anthrax, bovine tuberculosis, and leishmaniasis. Early detection and response to both emerging and neglected zoonotic diseases are vital to avoid detrimental effects in humans, global health security and economies. Middle East respiratory syndrome coronavirus (MERS-CoV), although not mentioned in the list above, is also a potential zoonosis in the country.

The public health system reports zoonotic diseases through the Integrated Disease Surveillance System that has an immediate and weekly reporting schedule, while the animal health sector reports zoonotic diseases on an immediate, weekly and monthly basis. Both systems have event-based reporting, although they are suboptimal and require improvement.

In the past years, Sudan has demonstrated commendable outbreak investigation for zoonotic events involving the Ministries of Health and Animal Resources and Rangelands, which has helped trace the source of infection and reduce the duration of containment and the amount of resources needed.

A plan of action has been developed for brucellosis and RVF surveillance and control to reduce spill over of these zoonoses into the human population. The plan includes public awareness and communication to encourage farmers and livestock-keeping communities to report animal diseases. The livestock census in Sudan is outdated (1973). According to estimates of the Food and Agriculture Organization (FAO), Sudan has the second largest livestock population among WHO Eastern Mediterranean countries with 33 million livestock units.

Sudan has good coordination mechanisms among relevant ministries, and reports of disease outbreaks are shared. Rapid response teams (RRT) for any suspected zoonotic outbreak, composed of human and animal health experts up to the Administrative Unit level, meet quarterly and more frequently during suspected zoonotic events. A memorandum of understanding and joint strategy exist between the FMoH and Ministry of Agricullture Recently, RRTs have successfully managed the CCHF and Brucellosis outbreaks through joint outbreak investigation with clear guidelines, defined roles and responsibilities. Sudan has capacity to respond to more than 80% of zoonotic events within 24–48 hours.

PREVENT

The two ministries (FMoH and MoAF) have strong epidemiology directorates linked to address zoonoses. One good practice from Sudan, in addition to regular coordination meetings, is the secondment of staff from one ministry to another to strengthen the bond as liaison for sustained functional linkages. The laboratories, however, are linked for major zoonotic outbreaks for sharing specimens and reports. Annually, Sudan undertakes surveillance in animals including for zoonotic diseases that pose a national health risk.

Sudan has a draft "One Health" concept note pending policy guidance and approval for its implementation.

In combating the threat of zoonotic diseases, regional cooperation should be strengthened to focus on building state-level capacity for surveillance, detection and rapid response in order to recognize, prevent, and treat emerging zoonotic diseases and reduce public health risk.

Recommendations for priority actions

- Operationalize and implement the One Health platform with consensus among public health, animal health, wildlife, and other relevant sectors.

- Develop mechanisms and operationalize coordination between public health and animal health laboratories.

- Map risk factors for high priority (ranked) zoonoses.

- Train focal persons in states and joint RRTs from human and animal health systems for zoonotic events, including simulation exercises.

Indicators and scores

P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens

Score 4: Demonstrated capacity.

Strengths and best practices
- Functioning collaboration and exchange of information for multisectoral response exist for zoonotic events of public health concern, including secondment of animal health staff to the FMoH.

- Obligatory reporting exists for priority zoonotic diseases for both human and animal health sectors with daily, weekly and monthly reports at the national level.

- Annual surveillance in animals exists for zoonotic diseases.

- RRTs with human and animal health experts meet quarterly, and more frequently in cases of suspected zoonotic events.

- A Memorandum of Understanding and joint strategy for zoonoses are in place between the FMoH and Ministry of Animal Resources and Fisheries (MoAF).

- Standard operating procedures (SOPs), guidelines and the sharing of specimens and reports between the FMoH and MoAF are in place.

- Established central veterinary and research laboratories provide the necessary research and diagnostic services for zoonosis and other diseases.

- Contingency plans are in place for RVF, CCHF, brucellosis, rabies, anthrax, bovine tuberculosis, and leishmaniasis.

Areas that need strengthening/ challenges

- A real-time surveillance system is needed for zoonotic diseases in an animal–human–wildlife–ecosystems interface for effective and timely response.

- Information (such as from rumours and the media) should be captured on zoonotic events of potential risk to public health along with a mechanism to collect and share data quickly such as in electronic forms.

- A skilled workforce must be maintained in surveillance and response for zoonoses in key sectors.

- Some zoonotic events from remote areas are underreported.

- Reporting and data management should be conducted using an electronic reporting scheme.

- A functional link between public health and animal health labs is needed for real-time information sharing.

P.4.2 Veterinary or animal health workforce

Score 4: Demonstrated capacity.

Strengths and best practices

- Sufficient animal health workforce is available at all levels (federal and state) with continuing education programmes in place.

- A national zoonotic committee is chaired at ministerial level.

Areas that need strengthening/ challenges

- Training for RRTs is insufficient at state levels.

- There is a high turnover rate of workforce to Gulf Cooperation Council countries.

- In-service training is lacking in field epidemiology and laboratory programmes, disease control, surveillance and One Health (a need to strengthen continuing education).

P.4.3 Mechanisms for responding to zoonoses and potential zoonoses are established and functional

Score 4: Demonstrated capacity.

Strengths and best practices

- Contingency plans exist for major zoonoses in both human and animal sectors.

- Timely and systematic exchange of information occurs among surveillance units of the FMoH and MoAF.

- Rapid and coordinated response to zoonotic events of potential national and international concern is over 90%.

- A coordination mechanism is in place at federal and state levels; A zoonotic focal persons network for 18 states is also available.

Areas that need strengthening/ challenges

- Integrated RRTs should be assigned and trained.

- RRT teams from different sectors need experience in real zoonotic events or joint exercises for preparedness.

- More joint meetings should take place for sustained information sharing among health sectors.

- Existing legislation and regulations should be updated in the human and animal health sectors to accommodate emerging issues on the One Health approach.

- Coordination, advocacy and communication on the One Health agenda needs to be sustained in different sectors.

Food safety

Introduction

Food and waterborne diarrhoeal diseases are leading causes of illness and death, particularly in less developed countries. The rapid globalization of food production and trade has increased the likelihood of international incidents involving contaminated food. The identification of the source of an outbreak and its containment is critical for control. Risk management capacity with regard to control throughout the food chain continuum must be developed. If epidemiological analysis identifies food as the source of an event, based on a risk assessment, suitable risk management options that ensure the prevention of human (or further) cases need to be put in place.

Target

States Parties should have surveillance and response capacity for food and water borne diseases' risk or events. It requires effective communication and collaboration among the sectors responsible for food safety and safe water and sanitation.

Sudan level of capabilities

For food to be safe for human consumption, it needs to pass stages of proper production, processing, distribution, preparation, storage and handling. Food safety hazards could occur at any stage of the food supply chain and hence effective controls throughout the chain are essential to avoid adverse human health effects and economic consequences of foodborne illness, injury, and food spoilage.

It is important to identify and train an adequate number of people to take part in food safety control, and investigation of foodborne disease outbreak and response. Equally important is the identification of focal points for food safety, animal health and the key laboratories that would be required to test clinical and/or food samples collected during field investigations.

The Environmental and Food Control Department, established under the FMoH Directorate General of Primary Health Care, is the regulatory body for food safety in addition to a coordination, executive and control role. The Food Control Administration and its branches are responsible for all food administrative, executive and legal activities as well as food inspection, sampling, and training. Other food safety and control stakeholders include the Ministries of Agriculture, Animal Resources and Fisheries, Industry, Justice, Science and Technology, and Trade; agencies (Atomic Energy, Customs, Sudanese Standards and Metrology Organization); the private sector and labour union, universities, media, national nongovernmental organizations (consumer protection associations); and international organizations such as WHO, FAO and the World Food Programme.

According to the Food Control Act 1973 and its regulations, food items, whether imported or locally produced should be registered by the National Food Registration Committee. Likewise, any food supplement needs to be approved by the National Food Supplement Committee. All imported foods at points of entry (PoE) must be inspected and checked for safety, and samples submitted for designated laboratory analysis, before being certified for human consumption. Unfit foods are destroyed or re-exported to their place of origin. Similarly, food items for export are submitted to the same inspection as for imported food before being declared fit for human consumption. Production of local foods is supervised and monitored by federal and local health authorities. Standards and specifications are usually set by the Sudanese Standards and Metrology Organization through different committees. FMoH is a member of committees related to health aspects.

There is no dedicated food safety laboratory and national labs are fragmented or distributed among different ministries and agencies. A unified system of laboratories, with a clear mandate and competencies among labs and institutions responsible for food control, is needed.

Sudan should establish an effective mechanism for rapid information exchange among all stakeholders during investigations of suspected foodborne disease outbreaks. A functioning communication mechanism among all food safety stakeholders, including the sharing of laboratory findings, should also be set up. In addition, a risk profiling of food safety problems would help identify opportunities for authorities to implement appropriate risk management strategies.

Surveillance systems for foodborne diseases, as well as coordination among relevant stakeholders, are weak. The food safety hazards common in Sudan are mainly associated with microbial contamination of food and water. The influx of refugees, internally displaced persons, the low level of awareness of food safety issues, and lack of knowledge are important factors.

Recommendations for priority actions

- Improve food safety inspections and control: electronic inspection, tracing and recalls.
- Ensure implementation of the tasks of the National Committee on Food Safety by establishing a national surveillance system for foodborne diseases and food contaminants; enhancing laboratory capacity; and installing a platform for information sharing between relevant sectors.
- Build the capacity of the food safety workforce and ensure continuing education.
- Develop awareness programmes targeting consumers and food handlers.

Indicators and scores

P.5.1 Mechanisms are established and functioning for detecting and responding to food-borne disease and food contamination

Score 3: Developed capacity.

Strengths and best practices

- A food safety situation analysis and priority actions are identified in the National Environmental Health Strategic Plan.
- National and international food safety standards are available.
- National laws and regulations are applied in food safety and control.
- There is good coordination among relevant sectors.
- Sudanese Standards and Metrology Organization laboratories are ISO 17025:2005 accredited.
- Although limited, a trained workforce is available.
- Laboratory capacity is available for testing microbial hazards, pesticides and veterinary drug residues (accreditation of these tests are required).
- A draft manual for foodborne disease surveillance, detection, investigation, and response to foodborne diseases emergencies is in place.
- Foodborne inspection uses relevant regulations and risk-based inspection guidelines.

Areas that need strengthening/ challenges

- Food safety awareness among stakeholders and the public in general should be enhanced.

- Training needs to be conducted for foodborne diseases detection and response.

- The indicator-based surveillance system should be transformed into a more real-time system.

- The influx of refugees and internally displaced persons with no control is a risk to food safety.

- There is a lack of regulations for allergens in food, antibiotic resistance, and pesticides residues.

- Joint exercises with stakeholders during real foodborne emergencies should take place to train teams to act immediately in case of risks or recalls.

- Coordination among food safety players needs to be improved with strong functional links established.

- Overlapping roles and duplicity of authority need to be worked out to streamline efficiency at national level.

Biosafety and biosecurity

Introduction

It is vital to work with pathogens in the laboratory to ensure that the global community possesses a robust set of tools – such as drugs, diagnostics, and vaccines – to counter the ever-evolving threat of infectious diseases.

Research with infectious agents is critical for the development and availability of public health and medical tools that are needed to detect, diagnose, recognize and respond to outbreaks of infectious diseases of both natural and deliberate origin. At the same time, the expansion of infrastructure and resources dedicated to work with infectious agents have raised concerns regarding the need to ensure proper biosafety and biosecurity to protect researchers and the community. Biosecurity is important in order to secure infectious agents against those who would deliberately misuse them to harm people, animals, plants or the environment.

Target

A whole-of-government national biosafety and biosecurity system is in place, to ensure that: especially dangerous pathogens are identified, held, secured and monitored in a minimal number of facilities according to best practices; biological risk management training and educational outreach are conducted to promote a shared culture of responsibility, reduce dual use risks, mitigate biological proliferation and deliberate use threats, and ensure safe transfer of biological agents; and country-specific biosafety and biosecurity legislation, laboratory licensing and pathogen control measures are in place as appropriate.

Sudan level of capabilities

A multisectoral Laboratory Working Group has developed a draft national policy on biosafety and biosecurity as part of the German Partnership Programme for Excellence in Biological and Health Security.

At facilities such as the National Police Laboratory, biosecurity concepts are implemented comprehensively including the control of entry by security guards, code access doors for manipulations, storage rooms and inventory of samples. Licensing for human and animal medical laboratories is only mandatory for private laboratories but biosafety and biosecurity elements are not part of the licensing process.

There is no national record or inventory of pathogens within facilities that store or process dangerous pathogens and toxins and what they house. A waste management system was established in the visited facilities; at the NPHL post-autoclaving waste enters the regular city waste management system and in the Central Veterinary Research labs, waste is incinerated only in national laboratories in Khartoum.

Training in biosafety and biosecurity is carried out at some central laboratories, but t no national training programmes are available for all laboratories and staff in the private, public sector and sciences.

Recommendations for priority actions

- Develop a biosafety/biosecurity system to apply the national strategic plan in collaboration with partners.
- Map all laboratories to collect information on their existing capacities and identify any agents and pathogens of concern that they store.

- Secure financial and human resources for the implementation of biosafety and biosecurity plans.

- Develop and conduct a national training programme for all staff in all facilities.

- Raise awareness among staff and the community by developing academic training and facilitating the establishment of biosafety/biosecurity associations.

Indicators and scores

P.6.1 Whole-of-government biosafety and biosecurity system is in place for human, animal and agriculture facilities

Score 2: Limited capacity. Sudan is currently developing a comprehensive biosafety and biosecurity system. In the police laboratory, biosafety and biosecurity policies are in place, and the human and animal health sector laboratories are starting to implement this process.

Strengths and best practices

- Comprehensive national biosafety and biosecurity legislation, while not finalized, is being developed.

- A laboratory biosafety and biosecurity manual has been developed by the National Laboratory Working Group committee.

- SOPs, Good Lab Practice guidelines, and personal protective equipment are in place in the central laboratories visited in Khartoum.

Areas that need strengthening/ challenges

- Agents and pathogens of concern have not been identified and there is no inventory by each ministry or facilities housing dangerous pathogens and toxins.

- Biosafety and biosecurity policies and guidelines are not yet implemented at all levels throughout the country including private sector laboratories.

- There is insufficient maintenance and service contracts for key equipment (e.g. certification of the biological safety cabinet, gloves boxes, reverse transcription polymerase chain reaction (RT-PCR) machines).

- An immunization policy for laboratory staff is needed.

P.6.2 Biosafety and biosecurity training and practices

Score 2: Limited capacity. Sudan has assessed training needs and identified gaps in biosafety and biosecurity training but has not yet implemented a national training plan for all laboratories in all sectors.

Strengths and best practices

- Personnel are trained in public laboratories on the transport of infectious substances according to United Nations regulations.

Areas that need strengthening/ challenges

- There is no national training programme in biosafety and biosecurity for all laboratories in all sectors.

- Academic training is lacking on biosafety and biosecurity for all public and private professionals to enhance their knowledge and skills.

Immunization

Introduction

Immunizations are estimated to prevent more than 2 million deaths a year globally. Immunization is one of the most successful global health interventions and cost-effective ways to save lives and prevent disease.

Target
A functioning national vaccine delivery system – with nationwide reach, effective distribution, easy access for marginalized populations, adequate cold chain and ongoing quality control – that is able to respond to new disease threats.

Sudan level of capabilities

The national EPI programme in Sudan is the most successful primary health care intervention in the country. Immunization is mandatory by Public Health Law for all target populations and vaccination cards are mandatory for school entry. Vaccines are provided free of charge to all target populations living in the country regardless of their nationality, including refugees.

Financially, the programme largely depends on international partners who cover almost all vaccines required by the programme (the Government of Sudan co-finances the new vaccines) and a most of the vaccine delivery operational costs for both routine schedules and campaigns. Substantial financial support has been provided by GAVI and other partners like the Polio Eradication Initiative, measles elimination Initiative, the United Nations Children's Fund (UNICEF) and WHO. GAVI support has been used primarily to improve routine immunization delivery, with a focus on establishing strong outreach and mobile strategies, recruiting and training vaccinators and providing incentives to staff to implement the outreach and mobile activities; and improving the cold chain and vaccine management. GAVI funds also cover vaccines and operational costs for yellow fever and meningococcal A vaccination campaigns. The polio and measles initiatives have been providing substantial support to help the country implement polio eradication and measles elimination strategies respectively.

 All vaccines required by the programme are procured through UNICEF Supply Division. Sudan has put in place a strong cold chain and vaccine management system that covers all administrative levels and secures continuous availability of required vaccines to all vaccination points in the country, including in the remote and high-risk areas. Sudan was the first country in the world to be certified by UNICEF for its excellent vaccine management system. The nationwide meningococcal A conjugate vaccine (MenA) and yellow fever vaccination campaigns in 2012–2013 and 2014–2015 respectively confirmed the high performance of the system.

A strong vaccine preventable diseases surveillance system has been put in place and the programme has reached the recommended performance standards, in particular for acute flaccid paralysis (AFP), and fever and rash laboratory case-based surveillance, as confirmed by independent reviews and assessments. The programme operates through a national multi-year plan (20112016), translated annually into national and state action plans as well as district micro-plans. A new multi-year plan, covering 2017–2021, will be developed based on the Global and Regional Vaccine Action Plans.

Achievements in the areas of cold chain and vaccine management, as well as in expanding and diversifying the vaccine delivery strategies, resulted in stopping polio endemic circulation and maintaining the country

polio free status (confirmed by the strong AFP surveillance system). The incidence of other vaccine preventable diseases like measles have also been reduced. New vaccines of epidemiologic interest have been successfully added to the EPI programme (pneumococcal conjugate vaccine, MenA and yellow fever) and successful nationwide campaigns have been implemented (MenA vaccine in 2012/2013 targeted 1–29 year-olds with 96% coverage, and for yellow fever, 11 of the 18 states covered in 2014/2015 reported 95% coverage, both results confirmed by field surveys). MenA vaccine has since been introduced into routine schedules and yellow fever will follow soon.

Unfortunately, the programme has been showing signs of fatigue over the last two years, which might put the above achievements at risk: reported immunization coverage figures have stagnated and even decreased, and the proportion of districts with less than 80% coverage is increasing. The programme is finding it difficult to sustain the outreach and mobile strategies, mainly because of insufficient financial resources, lack of transportation means, high staff turnover, and poor training of staff, mainly at the lower level. Population demand for routine immunization activities remains low and there is no clear strategy for regular social mobilization and community awareness-raising activities (activities are only conducted for immunization campaigns). These challenges have started to affect negatively the cold chain and vaccine management system, as some states are experiencing delays in vaccine distribution.

Sudan's experience with measles control and elimination also reflects difficulties in sustaining its performance. Between 2010 and 2015, four measles vaccination campaigns were conducted nationwide, all targeting the under-15 year-old population, and all reported more than 95% coverage figures. Despite this, the measles incidence rate remained high and measles outbreaks are still occurring, affecting mostly children under 9 years old, a high proportion of whom had received no dose of vaccine. This questions the quality of the data. In addition, data generated from the frequent measles outbreak investigations and responses do not seem to be used to rectify implementation of the measles control/elimination strategy. However, a district-level national coverage survey was conducted in 2015 to clarify the reasons for low performing districts and rectify denominators (results of this survey are not yet available).

Recommendations for priority actions

- Carry out refreshment training for lower level staff focusing on reaching every community, microplanning, data management and programme quality.

- Increase population demand for routine immunization through targeted and tailored community approaches.

- Increase access to routine immunization services with special attention to high-risk and hard-to-reach populations and areas through tailored district and health facility microplans, intensified outreach/ mobile delivery activities, and securing the required logistic support (e.g. transport for vaccine distribution and outreach/mobile activities, and incentives).

- Use measles outbreak investigation and response epidemiologic data, as well as measles immunization data, to identify high-risk populations and areas, to revise measles control/elimination implementation accordingly, and to prevent outbreaks.

- Develop a new multiyear plan in line with the Global Vaccine Action Plan, with special attention to sustaining cold chain and vaccine management achievements, increasing population demand, expanding access to regular and high quality routine immunization services for all hard-to-reach populations, and improving data quality and their use.

Indicators and scores

P.7.1 Vaccine coverage (measles) as part of national programme

Score 3: Developed capacity. While reported measles (measles containing vaccine 1st dose (MCV1)) immunization coverage is 87% at national level, it is less than 80% at in more than half the districts in the country.

Strengths and best practices

- Capacity is demonstrated during campaigns (but not routine) to deliver immunization services all over the country, with confirmed high coverage figures (polio, recent yellow fever and MenA campaigns).

- Strong social mobilization capacity is demonstrated during vaccination campaigns (but not routine).

- A strong vaccine preventable disease surveillance system exists, mainly for AFP, and fever and rash.

- There are good links with partners, with substantial financial support from GAVI Health Systems Strengthening window (around US$ 2 million per year for training, cold chain and outreach).

- Good community participation can be seen during polio vaccination campaigns (around 50 000 volunteers involved).

- A clear mapping and tracking system exists for nomads and flexible plans are available to reach them wherever they are.

- Most of the ground crossing points provide oral polio vaccine to all arrivals from high-risk countries.

- EPI staff are well aware of the current challenges; and plans in the pipeline to address them include:

  - Taking advantage of the expected high population demand for MenA and yellow fever vaccines (because of the great concerns and fear of these diseases) to improve measles vaccine uptake – MenA vaccine to be provided at the age of 9 months with MCV1, and the yellow fever vaccine at 15 months of age with MCV2.

  - Using the number of MCV1 doses instead of DPT3 (3rd dose of diphtheria, pertussis, tetanus) as a base for the performance payment process (in agreement with GAVI) – states and districts will receive operational costs proportional to the number of MCV1 doses they have provided.

  - Planning for low level staff refreshment training concentrating on the "reaching every community" approach and microplanning.

Areas that need strengthening/ challenges

- Financial, staffing and logistic challenges are affecting the programme capacity to improve and sustain routine vaccine delivery, in particular in remote and hard-to-reach areas (less staff, lower level staff lacking adequate training, few incentives and less transportation means to maintain outreach and mobile vaccination sessions).

- Funding of the EPI programme still very much relies on partners (Government of Sudan contribution has increased but is insufficient to secure programme sustainability).

- The programme is unable to replicate its performance in vaccination campaigns to routine immunization: lessons learnt and assets from campaigns are rarely utilized to improve routine immunization (microplanning, community participation, identification of defaulters and under-served groups, social mobilization, etc.).

- Population demand is low due to the lack of clear health education and population awareness activities targeting routine immunization.

- Measles outbreaks are frequent despite four measles campaigns conducted over the last six years.

- Measles outbreaks and response data are not adequately used to readjust implementation of measles control strategies.

- The programme is confronted with a denominator problem at state and district levels. Experience from vaccination campaigns proves that estimates based on 2008 and reported population growth rates are not correct. A district-level national coverage survey was conducted in 2015, the results of which are awaited by the programme.

P.7.2 National vaccine access and delivery

Score 5: Sustainable capacity. There is a very strong cold chain and vaccine management system (first country in the world certified by UNICEF for its vaccine management system. Vaccines reach everywhere in the country, including high-risk and most remote areas. The nationwide MenA vaccination campaign implemented in 2012–2013 reached very high coverage (>95%), including in high-risk areas, confirmed by field evaluation surveys.

Strengths and best practices

- The cold chain and vaccine management system are strong: a vaccine management assessment is planned for end of 2016, with the support of WHO, and a national survey for temperature mapping during all cold chain steps is planned with UNICEF and the Eastern Mediterranean Public Health Network (EMPHNET).

- Plans are available and regularly implemented to maintain achievements (e.g. regular monitoring and evaluation, staff capacity-building activities, equipment inventories and strengthening).

- Partners provide strong support (mainly GAVI, UNICEF and WHO).

- Cold chain capacity has proved capable to deliver vaccines all over the country, including in most hard-to-reach and difficult areas, as attested by the recent MenA and yellow fever campaigns).

- No vaccine stockouts have been reported for several years.

- A proposal for 5-year support from the GAVI cold chain optimization platform is being developed.

Areas that need strengthening/ challenges

- Maintaining trained staff is a big challenge (26 staff trained in 2015 on the cold chain and vaccine management have left the country).

- There has been a progressive decrease in vaccine transportation means at all levels: no specific refrigerator vans are available at national level (vaccines are being shipped through public transportation or using rented vans; and delays are being noted in vaccine delivery at state and district levels (but with no stockout so far).

- The above challenges have started to have a negative impact on systems and need to be urgently addressed in order to maintain the cold chain achievements.

DETECT

National laboratory system

Introduction

Public health laboratories provide essential services including disease and outbreak detection, emergency response, environmental monitoring and disease surveillance. State and local public health laboratories can serve as focal points for a national system, through their core functions for human, veterinary and food safety including disease prevention, control and surveillance; integrated data management; reference and specialized testing; laboratory oversight; emergency response; public health research; training and education; and partnerships and communication.

Target

Real-time biosurveillance with a national laboratory system and effective modern point-of-care and laboratory-based diagnostics.

Sudan level of capabilities

There are several stakeholders of the National Laboratory for Public Health in Sudan: police laboratory system (Ministry of Interior), military laboratory (Ministry of Defence), Ministry of High Education, health insurance (governmental and private), Ministry of Agriculture, Sudanese Standards and Metrology Organization, Council of Drugs and Poisons, Ministry of Mining, Advisory Board of Sudanese Medical Pathologists, customs laboratory (Ministry of Interior), Central Veterinary Research Laboratories Centre, Institute of Tropical Diseases, Khartoum State Laboratory Directorate (FMoH), atomic agency, Ministry of Environment, and the Regulatory Laboratory of Drugs and Poisons.

All these structure are represented in the National Laboratory Working Group (NLWG) committee, the coordinating body of laboratories in different sectors and ministries. A national policy for laboratories has been endorsed, a national blood policy has been approved as well as a national laboratories strategic plan for the Improvement of national laboratory capacities. A national medical laboratory quality structure (organogram) is available covering all laboratories in all sectors, and a phase 1 plan of a stepwise quality system implementation tool should start implementation in 2017.

Sudan's central laboratory capacity is good in the public sector. However, to improve prevention and detection of human and animal disease outbreaks, a well-defined national laboratory network is needed for both sectors at all levels – health facility, state, regional and national – as well as an effective referral system and networking between all levels. There is an urgent need to implement biosafety and biosecurity systems as well as quality management systems in line with national regulations, and to initiate a national protocol of inspection and assessment to oversee the implementation of the national laboratory standard.

Recommendations for priority actions

- Establish a reference laboratory (state public health laboratory, SPHL) in the 18 states for diagnostic and epidemiological purposes.
- Establish regional reference laboratories in some regions for technical direction and confirmatory laboratory services to SPHLs.

DETECT

- Define the package of laboratory services at all levels – health facility, state, regional and national – and establish an effective referral system and networking between all levels.

- Support a national specimen referral and transportation system within the laboratory referral and networking system.

- Establish a national laboratory quality programme for all health laboratories in the country and support total quality management system implementation towards certification/accreditation.

Indicators and scores

D.1.1 Laboratory testing for detection of priority diseases

Score 4: Demonstrated capacity. The national laboratory system is capable of conducting 5 or more of the 10 core tests for human health.

Strengths and best practices

- The laboratory systems in place are capable of detecting 7 of the 10 core IHR tests. The NPHL and all SPHLs are capable of testing microscopically for malaria and tuberculosis; the NPHL and some SPHLs can test for HIV (serological) and Salmonella; and NPHL tests for influenza, polio, and haemorrhagic fever (CCHF, chikungunya, dengue, RVF and yellow fever). Anthrax, bovine tuberculosis, animal influenza, Brucella, CCHF, leishmaniasis, rabies, and RVF testing are available at the Central Veterinary Research Laboratories Centre.

Areas that need strengthening/ challenges

- Maintenance contracts are lacking for key equipment as well as preventive maintenance in all the main facilities.

- There is a rapid turnover of trained staff.

- There is a shortage of reagents and supplies due to embargos.

D.1.2 Specimen referral and transport system

Score 3: Developed capacity. A system is in place to transport specimens to the national laboratory from 50–80% of intermediate level/districts within the country for advanced diagnostics.

Strengths and best practices

- Samples are transported from rural/district levels to NPHL under the responsibility of epidemiological focal persons in the state by specific contractor or private companies through FMoH epidemiology unit.

Areas that need strengthening/ challenges

- Some states experience delays in transportation due to conflict situations.

- There is poor quality management of samples due to:
  ○ the absence of appointed personnel with oversight responsibilities for sample management at national and state levels;
  ○ the lack of handbooks describing sample collection and providing testing information available to all who need this information.
  ○ the absence of a system to track samples as they move through the laboratory; and
  ○ the need to translate the existing policy into practice for sample storage and sample disposal; written policies for sample management are available but not effective or reflected in the laboratory handbook.

D.1.3 Effective modern point-of-care and laboratory-based diagnostics

Score 2: Limited capacity. Laboratory diagnostic capability exists, but no tier-specific diagnostic testing strategies are documented. Sudan is using the malaria rapid test in primary health facilities.

Strengths and best practices

- The central laboratories visited are proficient in classical diagnostic techniques including bacteriology, serology and polymerase chain reaction (PCR).

Areas that need strengthening/ challenges

- There is no well-defined and documented tier laboratory system with a formalized referral system for human health, animal health and environmental laboratories.

D.1.4 Laboratory quality system

Score 2: Limited capacity. National quality standards have been developed but there is no system verifying their implementation.

Strengths and best practices

- A system of licensing of private health laboratories is in place.

Areas that need strengthening/ challenges

- There is no external quality assurance (EQA) programme that cascades from national reference laboratories to the other laboratories and levels.
- There is no inspection and assessment to oversee implementation of the national laboratory standard.
- There is no national regulatory authority responsible for in vitro diagnostic devices (kits and reagents).

DETECT

Real-time surveillance

Introduction

The purpose of real-time surveillance is to advance the safety, security and resilience of the nation by leading an integrated biosurveillance effort that facilitates early warning and situational awareness of biological events.

Target

Strengthened foundational indicator, and event-based surveillance systems that are able to detect events of significance for public health, animal health and health security; improved communication and collaboration across sectors and between subnational, national and international levels of authority regarding surveillance of events of public health significance; and improved country and regional capacity to analyse and link data from and between strengthened, real-time surveillance systems, incorporating interoperable, interconnected electronic reporting systems. Epidemiologic, clinical, laboratory, environmental testing, product safety and quality, and bioinformatics data; and advancement in fulfilling the core capacity requirements for surveillance in accordance with IHR and OIE standards.

Sudan level of capabilities

Multiple public health surveillance systems exist in Sudan. The National Surveillance System and Early Warning Alert and Response System in the five states of Darfur and Kordofan are the only multidisease surveillance systems. Most systems support disease-specific vertical programmes such as EPI, tuberculosis, malaria, HIV/AIDS, noncommunicable diseases, nutrition, environmental health, mother and child health, reproductive health and neglected tropical diseases. Each of these siloed surveillance systems has its own list of "sentinel sites", with different data collected using disease-specific data reporting forms, submitted at varying frequencies to programmes. In 2014 a WHO technical mission to establish integrated disease surveillance and response (IDSR) resulted in an IDSR plan of action aimed at streamlining surveillance activities and saving resources. A task force meeting is planned to endorse these documents.

Indicator-based surveillance

The indicator-based National Surveillance System was first piloted in selected sentinel sites of three states in 2001, and expanded to all the 18 states of the country in 2002. It is basically a health facility-based sentinel surveillance system in which currently 1567 out of 5625 (28%) governmental health facilities serve as sentinel sites and have to report 25 notifiable diseases, if case definitions are fulfilled.

Sentinel sites have been selected using the following criteria: geographical distribution, coverage of different levels of the health system (referral hospitals, rural hospitals, health centres and dispensaries), catchment area, areas with past history of disasters and/or epidemics, vulnerability of populations (displaced and/or refugee) and the availability of resources. Although just 28% of all governmental health facilities are sentinel sites, a much larger proportion of the population might be covered through this selection. However, outbreaks in areas not covered by sentinel sites or in populations without access to health facilities may go undetected for a while, which minimizes the possibility of early response and containment. Despite plans to expand the number of sentinel sites, even up to total coverage, no significant changes have been observed over the last few years. The private sector is only marginally involved in the surveillance system.

Notifiable diseases are divided into list A diseases,[3] which require immediate case-based reporting within 24 hours, and list B diseases,[4] which have to be reported, together with list A diseases, on a weekly basis in an aggregated format to the epidemiological departments of the respective locality.

Surveillance guidelines for these 25 notifiable diseases are available with standardized case definitions (suspected, probable and confirmed), thresholds for alert detection, and response activities for each disease under surveillance. The last revision and update of the list of notifiable diseases by a technical committee was conducted in 2013. The suspected case triggers the notification and these case definitions are basically syndromic. If a list A disease is suspected, treating clinicians should request the designated surveillance focal person of the sentinel site to initiate immediate case-based reporting. For weekly reporting, data are extracted from patient registers as the primary source of information.

Laboratory capacities vary considerably, horizontally and vertically, between sentinel sites, localities and states. For laboratory confirmation of suspected cases, the system relies mainly on the diagnostic capabilities of the NPHL. As a consequence, laboratory confirmation for many notifiable diseases is only initiated if an outbreak is suspected.

Weekly data, collected at sentinel sites, has to be reported to the epidemiological department of the respective locality on Sunday, forwarded to the state epidemiological department on Monday and finally submitted to the surveillance unit of the epidemiology department at FMoH on Tuesday. Reporting is done via telephone or mobile (free of charge), by post, by fax or (mainly from state to federal level) by email. Standardized paper-based tools are available for summarized weekly reports as well as for disease-specific immediate reporting and case investigation. According to official reports, completeness and timeliness of weekly reporting from sentinel sites is more than 85%, but varies from state to state. The timeliness of immediate reporting of list A diseases seems to be of greater concern, mainly due to problems with communication (breakdown of telephone/mobile networks) or from lack of experience as result of high staff turnover.

Currently, there is no electronic system in place to enter surveillance data at subnational level for automatic access by the next levels. Web-based electronic reporting of surveillance data at state level was launched in 2009 but, despite training in two states, the system could not be sustained and was abandoned soon after its launch. There are plans to revisit electronic reporting, which should start implementation at state level in 2017.

Sentinel site surveillance data are systematically analysed at the epidemiological departments of the locality, the state FMoH and at the federal FMoH. Descriptive analyses are performed to monitor disease trends, to detect outbreaks and to trigger early response. Standard software used for data management and data analysis is Microsoft Excel. Geographic information systems (GIS) software is used to map geographical distribution of cases and for some diseases (e.g. meningitis) specific alert software has been established. Weekly reports are developed and sent to all 18 states and to relevant stakeholders. While feedback to the level below may be given on a weekly basis, this does not seem the case in all states, and certainly not at all localities. Capacity for data management and data analysis seems very good at federal level and good at state level, but requires additional training opportunities at locality and sentinel site level. High staff turnover is clearly a major challenge.

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[3]   Acute watery diarrhoea, AFP, Guinea worm disease, haemorrhagic fever, epidemic influenza, measles, meningitis, neonatal tetanus, epidemic plague, severe acute respiratory syndrome (SARS), epidemic typhus fever, and yellow fever.

[4]   Anthrax, brucellosis, diphtheria, dysentery, food poisoning, hepatitis A and E, malaria, pertussis, rabies, relapsing fever, adult tetanus, tuberculosis, and typhoid fever.

Event-based surveillance

Although event-based surveillance has not yet been formally established, some functions at the national, state and locality level are said to be available to capture events from the media, through school health units, quarantine units, some communities, prisons, military, and/or veterinary services, etc. Guidelines and SOPs for a comprehensive event-based surveillance system have been developed, but await approval. The next step will be a workshop to finalize and endorse the documents, followed by implementation of the system within the next year.

Syndromic surveillance

There are plans to introduce community-based surveillance in 2017 with syndromic surveillance as an integral part. The five syndromes to be covered are acute watery diarrhoea, haemorrhagic fever, acute jaundice, acute neurological syndrome, and acute respiratory syndrome. Guidelines and SOPs for community health workers have been developed and implementation has been piloted in selected communities in Red Sea and White Nile states. In addition to these syndromes, community health workers are asked to report events that might have an impact on health.

The sentinel site surveillance system can also be considered as form of syndromic surveillance, as "suspected cases" trigger notification and these case definitions are basically syndromic. It even covers four core syndromes indicative of public health emergencies (acute watery diarrhoea with dehydration, AFP, acute haemorrhagic fever, and SARS).

Field visits

Field visits were made to Soba University Hospital, Tropical Medicine Teaching Hospital, and the Primary Health Centre in Khartoum State.

Recommendations for priority actions

- Improve the existing sentinel site surveillance system in quality, timeliness and sensitivity by implementing syndromic surveillance in selected communities and event-based surveillance.
- Review coverage of the sentinel site surveillance system to include the number of reporting sites needed to optimize the quality of reporting.
- Train public health staff on reporting and analysis of surveillance data at local and state levels.
- Develop a small package of training materials and activities for periodic in-service training of health staff to improve the quality of local and state level reporting and analysis.
- Establish an electronic reporting system.

Indicators and scores

D.2.1 Indicator- and event-based surveillance systems

Score 3: Developed capacity.

Strengths and best practices

- Indicator-based surveillance
  - The national, sentinel site-based surveillance system, is in place with standardized reporting mechanisms.
  - Of the 25 diseases reported weekly, 12 have to be reported within 24 hours.

- o Standardized case definitions (suspected, probable and confirmed) are available for all notifiable diseases.
- o Expansion of the number of sentinel sites is planned to increase sensitivity of the system.
- o Completeness and timeliness of weekly reporting from sentinel sites seems to be good according to official reports.
- o During outbreaks, reporting is extended to all health facilities within a defined area and daily zero reporting is applied.
- Event-based surveillance
    - o While not formally in place, some event-based surveillance functions already exist in the country.
    - o Guidelines and SOPs for event-based surveillance are planned for implementation within the next year.
    - o A 24/7 hotline (9090) exists at federal level in the EOC.
- The IDSR plan of action, developed in 2014, is expected to be endorsed in the near future.

Areas that need strengthening/ challenges

- Sentinel site-based surveillance system
    - o There is no national surveillance system (only 28% of governmental health facilities are sentinel reporting sites), and the private sector is only marginally involved.
    - o Foodborne diseases are not sufficiently covered.
    - o Although three tiered case definitions (suspected/probable/confirmed) exist, reporting and analysis are mostly restricted to suspected cases.
    - o For laboratory confirmation of suspected cases, the system mainly relies on the diagnostic capabilities of the NPHL; limited laboratory capacity also exists at health facility level, locality level and in some of the states.
- Event-based surveillance
    - o Guidelines and SOPs are developed, but not yet approved.
    - o Implementation seems strongly dependent on available financial and human capacity.
- The IDSR plan of action was developed in 2014, but is not yet implemented.
- High staff turnover with all its negative consequences remains a challenge at all levels.

D.2.2 Interoperable, interconnected, electronic real-time reporting system

Score 1: No capacity. Currently, no electronic reporting system exists and it is not clear whether the planned system can provide interoperable and interconnected real-time electronic reporting.

Strengths and best practices

- An electronic reporting system is planned to be launched by end of the year.

Areas that need strengthening/ challenges

- Web-based electronic reporting of surveillance data, starting from state level, was launched in 2009, and training was conducted in two states but, due to several challenges, the system could not be sustained.
- Countrywide sustainable network coverage remains a challenge, which aggravates the implementation of a real-time electronic surveillance system down to health facility level.

DETECT

D.2.3 Analysis of surveillance data

Score 3: Developed capacity.

Strengths and best practices

- Surveillance data from sentinel sites are analysed at each level on a regular basis.

- Thresholds have been developed and used to identify outbreaks at locality, state and federal level.

- Weekly reports are submitted to the respective lower levels and to relevant stakeholders.

- Strong analytical capacity exists at federal level.

- Data validation and quality assurance is in place.

Areas that need strengthening/ challenges

- No sophisticated electronic database exists for surveillance data at national level.

- Excel is used for data storage, data management and data analysis up to national level.

- Capacity is limited for data management and analysis at locality and health facility level.

- There is high staff turnover at all levels.

- Links to laboratory results are limited to the national level.

D.2.4 Syndromic surveillance systems

Score 4: Demonstrated capacity. Although not formally syndromic, the sentinel site-based surveillance system covers four core syndromes indicative of public health emergencies (acute watery diarrhoea with dehydration, AFP, acute haemorrhagic fever, SARS).

Strengths and best practices

- In the sentinel site-based surveillance system, the "suspected case" triggers notification, the case definitions for which are basically syndromic.

- Guidelines and SOPs for community-based surveillance with integral syndromic surveillance are already developed and approved.

- Community-based surveillance is already piloted in two states (Red Sea and White Nile), for which full implementation is planned for 2017.

- Syndromic surveillance components are also used at PoE.

Areas that need strengthening/ challenges

- Coverage of sentinel-based surveillance is limited.

- Even though the four listed core syndromes require immediate reporting as part of list A in the sentinel site-based surveillance system, reporting within 24 hours is not always guaranteed.

- Finding the right balance between expanding the number of sentinel sites and introducing community-based surveillance as an integral part of national surveillance is challenging.

- Quality training of community health workers, adequate tools for reporting and good commitment in the community are essential for successful Implementation of community-based surveillance.

DETECT

Reporting

Introduction

Health threats at the human–animal–ecosystem interface have increased over the past decades, as pathogens continue to evolve and adapt to new hosts and environments, imposing a burden on human and animal health systems. Collaborative multidisciplinary reporting on the health of humans, animals and ecosystems reduces the risk of diseases at these interfaces.

Target

Timely and accurate disease reporting according to WHO requirements and consistent coordination with FAO and OIE.

Sudan level of capabilities

The national focal person is informed on a nearly daily basis through reports from focal persons in various institutions, including the FMoH, MoAF and the Sudanese National Radiation Resources Administration contact points. Each of these institutions has terms of reference for their functions.

There are no formal SOPs for the sharing of this information. In practice, information is shared with WHO for epidemic event on a weekly and monthly basis. Within the FMoH, information is normally collected via the Director for emergencies and control of epidemics, forwarded to the General Director of primary care, and is then sent to the Undersecretary of Health, who is the identified IHR NFP.

There is an effective system for reporting and consultation on zoonotic issues, but reporting for food safety issues is not systematic. The last training for IHR interagency reporting occurred in 2015. Even where mechanisms exist, staff turnover and the lack of funds for salary and equipment hamper the ability of the system to be comprehensive and timely.

The most recent potential PHEIC was the outbreak of acute watery diarrhoea, identified by rumour with a cluster of dramatic cases. No legislation has yet been passed, albeit proposed, for procedures and approvals for PHEIC reporting and the system thus remains informal. Further, reporting for food safety issues and for chemical and radiologic events has no established focal points or mechanisms.

Recommendations for priority actions

- Institute a focal point person for the International Food Safety Authorities Network (INFOSAN).
- Develop written SOPs for information sharing between contact points of international organizations and the IHR NFP and for reporting potential PHEICs to WHO.
- Use after-action reports from actual events, like the acute watery diarrhoea outbreak, and simulations from potential events, as in-service training for those responsible for surveillance and reporting.

Indicators and scores

D.3.1 System for efficient reporting to WHO, FAO and, OIE

Score 2: Limited capacity. Mechanisms are in place to exchange information between IHR NFP and the contact points of the World Organisation for Animal Health (OIE) for zoonotic diseases and other international organizations. The primary person in IHR NFP is a senior official with authority to report to WHO but in practice this is not operational and the system lacks SOPs for routine use.

DETECT

Strengths and best practices

- Director EOC is the IHR reporting officer, which strengthens organizational abilities.

- Strong consultation exists among central level personnel for reporting decisions.

Areas that need strengthening/ challenges

- Food safety is not yet integrated into the surveillance system.

- While protocols are in place, they are not often used in practice in an efficient or complete manner.

- Rapid turnover of staff affect stability of the system outside of high level personnel at the central level.

D.3.2 Reporting network and protocols in country

Score 3: Developed capacity. Functional relations and terms of reference for the IHR NFP and other focal points for reporting potential PHEIC are in place. Reporting related to chemical, radiological, and food events is very limited or non-existent, but EOC guidelines have been developed and endorsed.

Strengths and best practices

- Terms of reference exist for all IHR reporting personnel.

- Functional relations exist among many departments for information exchange.

Areas that need strengthening/ challenges

- There is no focal point for the International Food Safety Authorities Network.

- Clarity is needed on the responsible reporting entities for chemical events.

Workforce development

Introduction

Workforce development is important in order to develop a sustainable public health system over time by developing and maintaining a highly qualified public health workforce with appropriate technical training, scientific skills and subject-matter expertise.

Target

States Parties to have skilled and competent health personnel for sustainable and functional public health surveillance and response at all levels of the health system and the effective implementation of the IHR (2005). Workforce to include physicians, veterinarians, biostatisticians, laboratory scientists, farming/ livestock professionals, with an optimal target of one trained field epidemiologist (or equivalent) per 200 000 population, who can systematically cooperate to meet relevant IHR and Performance of Veterinary Services core competencies.

Sudan level of capabilities

Capacity to implement IHR is available at federal and state levels, but only partially at locality level. While human resources are available for biological hazards, those for other chemical and radiation hazards are deficient. A rapid response team specific for biological hazards is functioning at state level. The team includes epidemiologists, statisticians, laboratory specialists and assistants and clinicians. Remote, rural, or distant states have far fewer qualified or trained staff.

Staff retention is a major problem throughout the health system, particularly at the federal level as these staff have job options in other countries. Posts filled from staff with a public health background have a marginally better chance of staff retention, although training and skills to efficiently implement IHR may be lacking.

Despite some previous courses, Sudan is not currently part of any field epidemiology training programme (FETP), and no alternative long-term training programme is available. However, some staff have been trained outside of the country at FETP level, and short courses on outbreak investigation and response to epidemics are delivered inside or attended outside the country.

The strategy for human resources for health is partially implemented, but low salaries and the rapid growth of a private sector for health training and employment limit the ability to implement it well. Training for IHR is over-centralized; states and localities should be empowered to train staff in needed areas.

Recommendations for priority actions

- Join or create an FETP training programme.

- Develop a clear career ladder for the IHR workforce as part of the national strategy of human resources for health and the Framework on Health Workforce for Emergency and Humanitarian Response.

- Train and employ personnel able to deal with radiation and chemical hazards.

- Develop RRTs to deal with more than infectious disease hazards and use them as training teams to further develop the skills of personnel at the state and local levels.

DETECT

Indicators and scores

D.4.1 Human resources are available to implement IHR core capacity requirements

Score 2: Limited capacity. RRTs available in federal and state levels, and to some extent at the locality level, cover biological hazards; staff for radiation and chemical hazards, recently established, are available at federal level.

Strengths and best practices
- The need to have trained staff is recognized.
- Rapid response teams are available.

Areas that need strengthening/ challenges
- The range of skills in rapid response teams is limited.
- Access to training, especially at state and locality levels, is limited.
- Staff turnover is high, especially at the federal level.

D.4.2 Field epidemiology training programme or other applied epidemiology training programme in place

Score 2: Limited capacity. No FETP or applied epidemiology training programme is established.

Strengths and best practices
- Some staff have had training similar to FETP.

Areas that need strengthening/ challenges
- There is a need to organize FETP-like training for multiple levels of the health system.

D.4.3 Workforce strategy

Score 2: Limited capacity. The strategy for human resource for health (2012–2016) is reviewed regularly, with an annual report delivered. However, issues with assigning of targets for some indicators hinder tracking and review of the strategy.

Strengths and best practices
- Rapid response teams exist.

Areas that need strengthening/ challenges
- The workforce strategy does not cover public health staff.
- The lack of an FETP training programme severely affects the performance of RRTs and impacts staff retention.
- There is a shortage of human capacities, particularly with regard to chemical and radiation hazards.
- Centralized training affects the sustainability of capacities at the locality and state levels.

RESPOND

Preparedness

Introduction

Preparedness includes the development and maintenance of national, intermediate and community/primary response level public health emergency response plans for relevant biological, chemical, radiological and nuclear hazards. Other components of preparedness include mapping of potential hazards, the identification and maintenances of available resources, including national stockpiles and the capacity to support operations at the intermediate and community/primary response levels during a public health emergency.

Target

Preparedness will include the development and maintenance of national, intermediate and local or primary response level public health emergency response plans for relevant biological, chemical, radiological and nuclear hazards. This will cover mapping of potential hazards, identification and maintenance of available resources, including national stockpiles and the capacity to support operations at the intermediate and local or primary response levels during a public health emergency.

Sudan level of capabilities

The National Civil Defence Commission (NCDC) has developed an overarching national plan for emergency preparedness and response in the country. The National Committee for Emergency Preparedness and Response, established by law, is housed within the Supreme Council for Civil Defence. The Committee has clear roles and responsibilities and is headed by the Ministry of Interior. A national emergency management policy was developed in 2006 and updated in 2013. Two functional groups work under this policy, namely the command and control group and the technical committee. The command and control group comprises undersecretaries of all relevant ministries, and the technical committee provides them with technical support to respond to, recover from and mitigate emergency situations. The technical committee of the Supreme Council includes representatives from relevant sectors, including the FMoH. It meets regularly and on an as-needed basis. It has the authority to obtain any resources needed to respond to emergencies.

The comprehensive, national health emergency response plan falls under the umbrella of the NCDC plan, and has been validated and approved. The detailed, five-year public health plan, in place at federal and state levels, has been tested in real events. While lessons learnt have not yet been incorporated in the plan, two main issues have been raised, namely insufficient financial resources and trained personnel to respond to emergencies in some states. As a response plan, it lacks some key components of a preparedness plan such as recovery and mitigation processes (although these are carried out, they are not well documented or structured).

A disaster risk reduction strategy is in place. In the case of health emergencies, the health sector takes the lead in the response. A memorandum of agreement exists between FMoH and other sectors on their involvement during emergencies.

A permanent unit within the FMoH caters for all activities of emergency planning and preparedness. Due to the high workforce turnover rate, members of this unit keep changing. Hence activities such as implementation, and dissemination of the plan to all levels and states, are compromised.

Two coordination mechanisms exist. The first is the Emergency Coordination Committee for Health, which includes FMoH staff and concerned stakeholders from nongovernmental organizations, United Nations agencies and governmental bodies. While some members are permanent, others are invited based on the nature of the emergency. The second mechanism is a command and control group established at the FMoH and headed by the Undersecretary. The purpose of this body is to coordinate the response to public health emergences. The directors of different FMoH departments are members of this group, supported by technical committees as required.

A national risk assessment is done on an annual basis under the patronage of the NCDC by all ministries and relevant stakeholders. Risks are identified and mapped and include IHR requirements. Lead agencies are identified according to the risk, and roles and responsibilities are assigned to all relevant stakeholders. The public health plans (federal and state) are updated based on the outcome of the annual risk assessments/mapping.

Recommendations for priority actions

- Review the stockpiling systems to respond to chemical and radiological hazards.

- Develop a training programme for all sectors in order to have a bank of trained personnel to respond to different emergences.

- Allocate funds from the national budget (trust fund) to facilitate the rapid response to emergencies.

Indicators and scores

R.1.1 Multi-hazard national public health emergency preparedness and response plan is developed and implemented

Score 3: Developed capacity. The National Health Emergency Response Plan meets the IHR core capacity requirement and incorporates IHR-related hazards and PoE. It includes resource mobilization plans and procedures and, while the plan has not been tested, it is implemented in real events. Surge capacity plans to respond to public health emergencies of national and international concern are developed and implemented but still lack resources. Many elements of score 4 are present, namely procedures, plans or a strategy are in place to reallocate or mobilize resources from national and intermediate levels to support action at local response level, but the capacity does not extend to all state levels.

Strengths and best practices

- A well-developed and comprehensive national emergency response plan is validated, approved and implemented.

- Preparedness plans, policies and procedures have legislative and ministerial backing (National Health Law).

- Multisectoral and multidisciplinary RRTs are in place with well-defined SOPs.

- A public health plan incorporating all IHR hazards is in place and updated regularly. The national committee has the authority to mobilize resources from one level to another to respond to emergencies; however the country does not have the surge capacity to respond to all public health hazards.

Areas that need strengthening/challenges

- A training needs assessment should be carried out pertaining to emergency preparedness and planning activities. Hence a training programme could be developed for all levels of both tactical and strategic functions within the FMoH.

- A dissemination strategy should be developed for the preparedness plan at all state levels of the country.

- Surge capacity should be enhanced and strengthened to cover all IHR-related hazards (namely radiological and chemical hazards) and extended to all states.

- A financial policy and procedures should be developed to support all activities of emergency preparedness, e.g. response, recovery, mitigation, and training.

R.1.2 Priority public health risks and resources are mapped and utilized

Score 4: Demonstrated capacity. National profiles on risks and resources have been developed and are reviewed at least on an annual basis, and stockpiles (critical stock levels) for responding to priority biological, chemical and radiological events and other emergencies are accessible.

Strengths and best practices

- A multidisciplinary, multisectoral working group performs risk assessments under the patronage of the NCDC on an annual basis. This forms the basis of resource allocation for the preparedness process of the priority risks among all stakeholders of the country.

- Resources are mapped at most state levels and a plan to mobilize them from one level to another exists.

- Funding for the above processes is assured by more than one allocated donor (Ministry of Finance, UNICEF, WHO).

Areas that need strengthening/ challenges

- The capacities of the existing stockpiling systems should be enhanced to respond to all IHR-related hazards and extended to all state levels.

- A resource utilization and mobilization protocol during emergencies should be developed to cover all states and stakeholders.

- A procedure for risk and resource assessment during unforeseen and emerging threats is needed.

RESPOND

Emergency response operations

Introduction

A public health emergency operations centre is a central location for coordinating operational information and resources for strategic management of public health emergencies and emergency exercises. Emergency operations centres (EOC) provide communication and information tools and services, and a management system during a response to an emergency or emergency exercise. They also provide other essential functions to support decision-making and implementation, coordination and collaboration.

Target

Countries with capacity for: a public health emergency operations centre functioning according to minimum common standards; maintaining trained, functioning, multisectoral rapid response teams; real-time biosurveillance laboratory networks; information systems; and trained emergency operations centre staff capable of activating a coordinated emergency response within 120 minutes of the identification of a public health emergency.

Sudan level of capabilities

The country has developed the structure of an EOC at the federal and some state levels. The EOC has the appropriate physical structure to augment strategic functions in response to a medical emergency at the state level. The federal EOC has the necessary means both in space and function to accommodate expanding emergency situations. The incident commander is the state minister or if required the federal undersecretary. Necessary communications equipment (video telecommunications system, Internet, telephone, hotline, etc.) is available to connect to other EOCs in different states and with the national EOC when required.

Appropriate logistical support, although present, is not very robust, for example the lack of back-up electrical generators. Sufficient staff deal with the different functions of the EOC, but not all are trained to fulfil their duties. Capacity is available to provide technical information to aid decision-makers during an emergency. This is done through a multidisciplinary and multisectoral group of experts who are present at the EOC during the emergency.

Activation of the EOC can be done 24/7 via various state-level triggers, is timely, and can expand to different levels of alertness. SOPs to activate and run the EOC has been developed and implemented in real scenarios within the past year. Unfortunately, due to the high workforce turnover rate, not all members of the EOC are trained in this SOP, and lessons learnt have not been incorporated in the SOP. No training needs assessment has been carried out and no post for a training coordinator has been incorporated within the system. There is a lack of 'just-in-time training' that should be provided during an emergency for the responding multisectoral personnel.

Once the EOC is activated, strategic decision-makers meet on a daily basis and produce a plan of action for the following 24 hours. Capacity exists to upscale the response to an hourly meeting of decision-makers. These meetings lack a system of process and documentation.

RRTs available at the federal and state levels can provide on-site assistance as needed for investigation, treatment and reporting to concerned parties within 24 hours of initial notification. These multidisciplinary, multisectoral teams include the security sector and are managed by the outbreak response unit at the epidemic department. Recourse required for the RRT is available in a timely manner.

Case definitions and case management guidelines for priority infectious diseases are available to the relevant personnel. Not all IHR-related hazards have case management procedures (e.g. radiological, chemical).

Recommendations for priority actions

- Develop and enforce a training plan for potential members of the EOC wherein emergency preparedness training would be mandatory.

- Develop and implement case definition and case management plans for chemical and radiological events.

- Expand the EOC to be operational at all state levels.

Indicators and scores

R.2.1 Capacity to activate emergency operations

Score 2: Limited capacity. Many elements of score 4 are present, such as the presence of SOPs, but not all staff are trained in them. This is mainly due to high workforce turnover and new staff not being trained in the SOPs.

Strengths and best practices

- Major financial investments have been made to develop and run the EOC at the federal level which support the strategic and tactical response to an emergency.

- The EOC is well equipped with personnel, plans, information systems and communications equipment to accommodate any level of emergency response.

- Triggers to activate the EOC are in place with available staff, and a dedicated hotline and 24/7 point of contact are available in case of emergencies (9090). Procedures to activate the EOC at multiple levels of alertness are possible and have been practised in real scenarios in the past year.

- Dedicated staff and SOPs are available to support the functions of the EOC.

Areas that need strengthening/ challenges

- Logistical support should be enhanced and made more robust (e.g. back-up electrical generators) to facilitate the functionality of the EOC during emergency response.

- A training needs assessment should be performed, perhaps by appointment of a training coordinator, and a training programme should be developed.

- The EOC should be expanded to be operational at all state levels.

R.2.2 Emergency operations centre operating procedures and plans

Score 3: Developed capacity. The recently established EOC has SOPs and plans/procedures that describe key structural and operational elements for basic roles such as incident management or command, operations, and planning. Other supporting documents such as job action aids are under development.

Strengths and best practices

- A well-developed SOP on the EOC has recently been implemented; structural and functional components have been addressed including, but not limited to, public communications.

Areas that need strengthening/ challenges

- The following plans need to be developed and implemented: concept of operations; forms and templates for data collection, reporting, briefing; and role descriptions and job aids for EOC functional positions.

- The EOC needs a plan that describes scaled levels of response with resource requirements for each level and procedure for acquiring additional resources.

RESPOND

R.2.3 Emergency operations programme

Score 4: Demonstrated capacity. In response to floods in different areas in 2015, the EOC was activated in a timely manner and the SOPs implemented and successfully tested.

Strengths and best practices

- The EOC has been activated in real incidents in a timely manner. This has validated its functional and structural role and its SOP.

- There is a good mechanism of coordination between the various stakeholders of the response functions.

- During a real-time incident, strategic decision-makers met on a daily basis in coordination with the affected states and a strategic plan of action was followed.

Areas that need strengthening/ challenges

- SOPs for emergency meetings should be developed, e.g. frequency, minutes, member designations, daily objectives, etc.

- Evaluation of the structural and functional components of the activation and response of the EOC should be conducted. Hence a corrective action plan (if required) should be developed and the SOPs updated.

R.2.4 Case management procedures are implemented for IHR relevant hazards

Score 2: Limited capacity. Case management guidelines for priority diseases such as Ebola and MERS-CoV are in place. Case definition and management guidelines for other IHR hazards (radiological, chemical) need to be developed. Although SOPs for the management and transport of potentially infectious patients in the community and at PoE are in place (elements of score level 4), not all IHR-related hazards are covered.

Strengths and best practices

- Well-developed multidisciplinary case management guidelines exist for priority infectious diseases.

- Priority epidemic-prone disease case management, patient referral and transportation, and management and transport of potentially infectious patients are implemented according to guidelines and SOPs.

- Certain medical facilities have been nominated as treating facilities for specific hazards both at federal and state levels.

Areas that need strengthening/ challenges

- Case definition and case management guidelines and SOPs for radiological and chemical emergencies should be developed.

- Staff training needs to be developed in accordance with case management guidelines for radiological and chemical emergencies.

- Resources should be developed to manage radiological and chemical emergencies at all state levels.

Linking public health and security authorities

Introduction

Public health emergencies pose special challenges for law enforcement, whether the threat is manmade (e.g. an anthrax terrorist attack) or naturally occurring (e.g. an influenza pandemic). In a public health emergency, law enforcement will need to coordinate its response rapidly with public health and medical officials.

Target

In the case of a biological event of suspected or confirmed deliberate origin, a country will be able to conduct a rapid, multisectoral response, including the capacity to link public health and law enforcement, and to provide and/or request effective and timely international assistance, such as to investigate alleged use events.

Sudan level of capabilities

The Government of Sudan has national legislation that allows the public health sector to call for the support of the security sector to implement public health measures. To apply this legislation, a Memorandum of Understanding between the public health and security authorities was developed as part of the national preparedness and response plan. This covers FMoH, MoAF, Ministry of Interior (including Civil Defence, Police and Customs) and Ministry of Defence (National Security and National Army). It indicates clearly the roles and responsibilities for both sectors during emergencies. While this kind of agreement does not formally exist at state level, state representatives of the public health and security sectors act systematically according to the above-mentioned legislation and agreement in the case of a local emergency or public health event.

In 2013, a table-top exercise was conducted in 12 states, with representatives from relevant sectors within the public health and security authorities, on topics related to information sharing and joint investigations/responses. The security sector has members on the National Outbreak Committee and a Ministry of Interior focal point is in place in the FMoH. This facilitates coordination and systematic information sharing between the two sectors at national level. Regular reports provided by FMoH on health events are sent by the public health and security sectors to their representatives in the states.

This coordination mechanism has been tested and proved to be efficient in several real events. In 2012, the security sector provided substantial support to public health to respond to the yellow fever outbreak. Similarly, the October 2016 watery diarrhoea outbreak witnessed strong coordination between the two sectors and a substantial contribution from the security sector to FMoH (logistics, deployment of medicines to hard-to-reach villages, air transport to visit all areas, police to prevent consumption of unchlorinated water from the Nile, etc.). Security sector support has also assisted, inter alia, implementation of vector control activities in north Darfour, as well as control of livestock movements between states and between Sudan and neighbouring countries.

Involvement of the security sector is decided at high level, including the national Supreme Council for Emergency and Disaster Management, and consists mainly in providing logistics support and access. At state level, decisions on security sector involvement is decided by similar committees headed by the "Walli" (governor). At local level, customs are involved at PoE in the inspection of goods, movement of people, and the police supports the inspection of restaurants, factories, etc.

Recommendations for priority actions

- Develop SOPs for the joint investigation and response of the public health and security sectors.

- Involve the security sector in capacity-building activities conducted by the public health sector.

- Review the effectiveness of the security sector in the implementation of public health measures and incorporate lessons learnt in future response plans.

Indicators and scores

R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) are linked during a suspect or confirmed biological event

Score 5. Sustainable capacity. Several examples demonstrate the capacity of the public health sector to call for the support of the security sector to implement public health measures. The security sector has provided the required support in terms of logistics, access and security for public health officers.

Strengths and best practices

- Strong legislation allows the health sector to request support from the security sector whenever needed to control/respond to emergencies and other health events.

- A clear Memorandum of Understanding between the public health and security sector specifies roles and responsibilities.

- The security sector has members on the National Outbreak Committee and thus direct access to information on outbreaks that can be used to provide the required support when needed.

- A table-top exercise enabled all sectors to discuss information sharing and joint investigations/ responses. In addition, the security sector medical services participate regularly in FMoH workshops and training.

- Weekly and monthly epidemiological reports are shared with intelligence services, who are involved in the weekly and monthly meetings of the epidemiology department.

- The security sector is well represented on the national Supreme Council for Emergency and Disaster Management, a strategic platform where information on events is shared and event response managed.

- Coordination and support mechanisms have been tested during real events and proved to be efficient.

Areas that need strengthening/ challenges

- The response and involvement of the security sector have not been reviewed and hence lessons learnt are not incorporated into plans for future response to public health events.

Medical countermeasures and personnel deployment

Introduction

Medical countermeasures are vital to national security and protect nations from potentially catastrophic infectious disease threats. Investments in medical countermeasures create opportunities to improve overall public health. In addition, it is important to have trained personnel who can be deployed in case of a public health emergency for response.

Target

A national framework for transferring (sending and receiving) medical countermeasures and public health and medical personnel among international partners during public health emergencies.

Sudan level of capabilities

Sudan has faced many medical emergencies and most recently the Ebola pandemic. During the last few years Sudan has gained experience in sending medical teams to Libya, South Sudan, and Yemen, and received expertise and supplies from Saudi Arabia, Turkey, United Arab Emirates, etc. These are multidisciplinary, multisectoral activities. A plan is being implemented for sending and receiving medical countermeasures and personnel. The plan was revised in 2015 to incorporate response and recovery experiences. A national policy is currently awaiting approval in Parliament.

The activities of sending and receiving medical countermeasure and personnel has legislative backing under the Sudan Medical Council Law. This facilitates movement and related activities across borders. A lack of resources has been identified, mainly staff and equipment, but commitment is high among the participating sectors.

Every year, Sudan sends a medical contingent to the Hajj pilgrimage to Saudi Arabia by agreement between the two countries. This contingent comprises countermeasures and medical personnel with access to security, shelter, medical licensing and logistics.

The relevant stakeholders involved in medical countermeasures and personnel are: National Fund for Medical Supplies; Health Emergency and Epidemic Control; Drugs and Poisons National Council; National Medical Council; Pharmacy Department; Customs Authority; Sudanese Standards and Metrology Organization; Ministry of Trade; Ministry of Finance; and the Humanitarian Aid Commission.

Recommendations for priority actions

- Finalize the national policy for sending and receiving medical countermeasures and personnel.
- Develop a coordination strategy between national stakeholders to enhance the sending and receiving of medical countermeasures and personnel from/to different countries.
- Expand the involvement in international entities such as the Global Outbreak Alert and Response network (GOARN), to respond to public health events in different countries.

RESPOND

Indicators and scores

R.4.1 System is in place for sending and receiving medical countermeasures during a public health emergency

Score 5: Sustainable capacity.

Strengths and best practices

- Sudan Medical Council Law and the Sudanese Medical Profession Council Law form the legislative backing for sending or receiving medical countermeasures.

- There is high morale among the personnel from different sectors during emergencies, which facilitates movement of countermeasures across borders.

- There are regional agreements for procurement of supplies during emergencies.

Areas that need strengthening/ challenges

- A coordination strategy needs to be developed between the relevant national stakeholders for maximum efficiency in sending and receiving medical countermeasures.

- A review of security protocols is needed to mitigate medical countermeasures filtering into the local market.

- The stockpiling system should incorporate radiological and chemical countermeasures.

R.4.2 System is in place for sending and receiving health personnel during a public health emergency

Score 5: Sustainable capacity.

Strengths and best practices

- Sudan Medical Council Law and the Sudanese Medical Profession Council Law form the legislative backing for sending or receiving medical personnel.

- Sudan has regional agreements in place with countries like Saudi Arabia for sending medical personnel on the annual Hajj pilgrimage.

Areas that need strengthening/ challenges

- A mechanism should be enhanced to provide and receive medical licensing for personnel from/to different countries.

- Sudan's involvement should be expanded in different entities like the Global Outbreak Alert and Response network to respond to global emergencies.

Risk communication

Introduction

Risk communication should be a multi-level and multi-faceted process that aims to help stakeholders define risks, identify hazards, assess vulnerabilities and promote community resilience, thereby promoting the capacity to cope with an unfolding public health emergency. An essential part of risk communication is the dissemination of information to the public about health risks and events, such as outbreaks of diseases. For risk communication about a specific event to be effective, the social, religious, cultural, political and economic aspects associated with the event should be taken into account, as well as the voice of the affected population. Communications of this kind promote appropriate prevention and control action through community-based interventions at individual, family and community levels. Disseminating the information through the appropriate channels is essential. Communication partners and stakeholders in the country need to be identified, and functional coordination and communication mechanisms established. In addition, the timely release of information and transparency in decision-making are critical to build trust between authorities, populations and partners. Emergency communications plans need to be tested and updated as needed.

Target

States Parties should have risk communication capacity which is multi-level and multi-faceted real time exchange of information, advice and opinion between experts and officials or people who face a threat or hazard to their survival, health or economic or social well-being so that they can take informed decisions to mitigate the effects of the threat or hazard and take protective and preventive action. It includes a mix of communication and engagement strategies like media and social media communication, mass awareness campaigns, health promotion, social mobilization, stakeholder engagement and community engagement.

Sudan level of capabilities

As highlighted in the 2014 IHR Assessment Mission report, Sudan has demonstrated capacity to communicate health risks, particularly in the area of disease outbreaks and natural disasters.

A National Risk Communication Plan was endorsed in September 2016 by FMoH, thus achieving a critical milestone of the IHR (2005) and aligning health communication efforts across Sudan's three levels of government and between different sectors. This, combined with the scale-up of a specialized Health Promotion Directorate in charge of risk communications and community engagement at federal level, has strengthened Sudan's risk communications platform.

The FMoH recognizes that as a second step, strong operational communication structures and procedures need to be developed to ensure better information sharing and regular coordination between sectors, especially for multihazard emergency response. The FMoH is expanding its network of community health volunteers by providing training to student and women's groups, midwives, and religious and community leaders in an effort to scale up community engagement.

A 2006–2010 Health Promotion Strategy was revised and updated in 2012. The strategy outlines key components for community engagement, including stronger linkages with community groups, enhanced interaction between health-care providers and their clients, building far reaching multimedia campaigns, training staff, monitoring and evaluating activities for their effectiveness, and learning lessons.

The media, largely made up of television, newspapers and radio, are all state controlled. Information sharing is traditionally top-down, with FMoH providing health-related information bulletins to the press for

publication on an as-needed basis. The FMoH conducts basic media monitoring and uses two social media platforms, Facebook and WhatsApp, to distribute information. However, these platforms are only accessible to persons who have Internet, which in Sudan amounts to 22.7% nationwide.

As with many other IHR core capacities in Sudan, limited human and financial resources are a constraint to successful risk communication activities. The Health Promotion Directorate team requires extra training in risk communication skills, and appropriate technologies upon which to build an operational platform to work efficiently and credibly with other sectors and partners during both public health and humanitarian emergencies.

The cultural and linguistic diversity across the country is an overarching challenge for health communications. There is a need to establish an evidence base for risk communications and to conduct anthropological research to inform health-care staff how to engage and mobilize ethnically diverse communities.

Recommendations for priority actions

- Operationalize national risk communication strategy through plans and SOPs with involvement of relevant stakeholders and partners.

- Improve collective risk communications knowledge and capacity through evaluations of health emergency responses and anthropological research in communities; this will build the evidence base.

- Enhance media monitoring and feedback with hotlines and social media.

- Provide risk communication training for relevant staff in FMoH and other ministries at national and local levels.

Indicators and scores

R.5.1 Risk communication systems (plans, mechanisms, etc.)

Score 2: Limited capacity. A formal government structure exists for risk communications and health promotion with strong FMoH commitment to improve staff skills and develop sustainable, cross-sectoral, national capacities in this area of work. A central, health promotion team under the leadership of the FMoH Undersecretary, who also serves as the IHR NFP, has helped to strengthen collaboration and coordination across sectors when it comes to communicating risk.

Strengths and best practices

- A national risk communication plan developed in 2014 was endorsed by the FMoH in September 2016.

- A specialized health promotion unit within the FMoH, made up of 32 staff, has been established bringing together risk communication and health promotion functions under one team.

- Prior real-time experience in communicating health risks during disease outbreaks can be used to harness best practices and lessons learnt for risk communication platforms.

Areas that need strengthening/ challenges

- The concept of risk communications lacks common understanding across all sectors. This requires urgent investment in training and evidence-based research to develop in-country ownership and high-level endorsement and commitment for risk communication activities.

- Strong operational platforms need to be developed to ensure that risk communications support is provided to all areas of public health in a systematic manner across other sectors such as animal health, food safety, immunization, chemicals and radiation.

- Dedicated federal and state level budgets and plans are needed to strengthen multisectoral risk communication capacity.

R.5.2 Internal and partner communication and coordination

Score 3: Developed capacity. Coordination and collaboration for risk communication exists between sectors and partners but are not supported by SOPs. For emergency response, a functional EOC is in place and risk communication procedures are well integrated.

Strengths and best practices

- The EOC contributes to internal communication and coordination using video technology to link up with state and local government officials and to develop operational procedures to respond more effectively to multihazard emergencies.

- The EOC has a network of 2500 mobile phones for state and local health officials in order to develop a fast, unified, integrated two-way system for surveillance, reporting and risk communication.

- Strong partnerships exist within the health sector to detect and manage disease outbreaks and these processes can be transferred to other sectors where linkages are weaker.

Areas that need strengthening/ challenges

- Involvement should be increased, and strategies developed for civil society, media, private sector, international organizations and leaders at state and local levels to have more coordinated communication activities.

- Risk communication staff and resources should be scaled up in all states to be better prepared to respond to health emergencies.

- In other sectors such as food safety, chemical and radiological events, and animal health, communication coordination mechanisms need to be strengthened.

R.5.3 Public communication

Score 3: Developed capacity. Public communication is managed by the Health Promotion Directorate, mostly through traditional media outlets such as radio, newspapers and TV. Social media is used for information sharing when Internet connectivity is available. In states with poor connectivity, public information is transmitted through radio and community health volunteers in both Arabic and local languages.

Strengths and best practices

- The FMoH Undersecretary has the authority to release health messages and to communicate directly with the media. If necessary, media engagement can also be delegated to FMoH senior directors.

- The National Risk Communication Plan has outlined a strategy for more proactive media engagement, which includes regular briefings with journalists, timely information dissemination, and increased coordination with state and local health officials for better health surveillance and reporting; when implemented, this will strengthen public information efforts.

Areas that need strengthening/ challenges

- Media engagement is on an ad hoc basis and public information is often delayed because of challenges related to surveillance, detection and reporting. A cultural shift towards transparency and announcing information early will improve media engagement and help build public trust.

- Media engagement plans that include SOPs and organizational charts are required and must be updated for every new public health event or humanitarian crisis.

RESPOND

- Regular media briefings and dissemination of press releases, questions and answers (Q&As), infographics, are required to expand the knowledge and engagement of journalists on health issues.

- The media would benefit from specific training on health reporting.

R.5.4 Communication engagement with affected communities

Score 3: Developed capacity. The Health Promotion Strategy, revised and updated in 2012, outlines key components for community engagement. However these activities have yet to be operationalized. SOPs are in place to produce information, education and communication (IEC) materials in local languages focusing on healthy lifestyle behaviours, promoting environmental sanitation, reproductive health, nutrition and maternal and newborn care. The Health Promotion Directorate has expanded community health volunteer networks which are trained to support health promotion activities in underserved states to compensate for the lack of health promotion staff at primary health-care centres.

Strengths and best practices

- IEC materials use visual aids over text to accommodate high illiteracy rates in certain communities.

- During disease outbreaks, community health volunteers are remunerated as an incentive to increase targeted health promotion in affected areas. These volunteers could help in monitoring rumours and public concerns, conduct Knowledge, Aptitude and Practice (KAP) studies and evaluations, to build a strong evidence base for risk communication and community engagement within Sudan's diverse cultural populations.

- In states (Darfur, Blue Nile) with protracted humanitarian emergencies, the presence and support of international agencies and nongovernmental organizations has contributed to increased health promotion and community engagement activities. Best practices from these states could be transferred to underserved areas.

Areas that need strengthening/ challenges

- A dedicated budget and communication plans at state ministry of health level are required to scale up community engagement in hard-to-reach, rural areas.

- Active participation and ownership by local communities is needed in the planning, decision-making and feedback process for community engagement activities, particularly in emergency response.

R.5.5 Dynamic listening and rumour management

Score 2: Limited capacity. A basic media monitoring system exists at Federal level through which information is gathered from newspapers, radio and TV and shared with state level health ministry officials. Across all levels (federal, state, and local) some ad hoc mechanisms exist for community feedback to health-care workers, although rumour management systems have not been developed.

Strengths and best practices

- The federal Health Promotion Directorate conducts daily screening of newspapers for any health-related news or articles and addresses rumours as necessary.

- The network of community health volunteers can be developed into a two-way platform for feedback from local communities and information from health-care workers to encourage locally accepted dynamic listening and rumour management systems, and build trust in the public health system.

- The EOC's mobile network can be used to strengthen feedback from state/local to federal level health-care staff.

Areas that need strengthening/ challenges

- Dynamic listening and rumour management process mechanisms need to be formalized and integrated into internal and partner coordination, public communication and community engagement processes.

- In urban areas, systematic monitoring of social media sites can help to identify public health concerns and patterns that are not picked up through regular media monitoring. The information gathered can be used to manage rumours and enhance two-way information sharing between the public and health-care professionals.

OTHER IHR-RELATED HAZARDS AND POINTS OF ENTRY

Points of entry

Introduction

All core capacities and potential hazards apply to points of entry and thus enable the effective application of health measures to prevent international spread of diseases. States Parties are required to maintain core capacities at designated international airports and ports (and where justified for public health reasons, ground crossings) that will implement specific measures to manage a variety of public health risks.

> **Target**
>
> *States Parties to designate and maintain core capacities at international airports and ports (and where justified for public health reasons, a State Party may designate ground crossings), which implement specific public health measures required to manage a variety of public health risks.*

Sudan level of capabilities

Sudan has four international airports, two ports and seven ground crossings. Of these border crossings, three have been designated PoE for IHR implementation: one airport, one seaport and one ground crossing. Even though the other PoEs (mainly ground crossings) constitute a public health risk to the country due to the volume and frequency of various types of international traffic, Sudan has chosen not to designate them for IHR implementation. The following capacities exist at the designated airport and port but not at the ground crossing.

The FMoH is the competent authority for all designated PoE. The public health and medical services are provided mainly by the FMoH and by airport and port operators. The Ministry of the Agriculture is in charge of the control of imported agricultural products and the MoAF is responsible for imported animals for all PoE.

Collaboration and coordination exist among the different stakeholders at PoEs, including at the ground crossing. International communication links are in place with other international PoEs. Means of communication are available to share information on public health events/measures. A procedure concerning communication between pilots-in-command of aircraft, masters-in-command of a ship carrying suspected cases, and competent authorities at the airport and port are in place and functioning.

Two clinics are available in the airport, managed by the FMoH and the airport authority, and one clinic at the port managed by the FMoH. The clinics provide services for ill travellers and accompaniers. Arrangements are in place to refer ill passengers to other medical and diagnostic facilities for further diagnosis and management. An on-call ambulance is available to transport ill passengers to health facilities. Sufficient personnel are available to run day-to-day public health activities; however, they are not sufficiently trained to carry out the assessment, treatment and isolation of ill travellers and affected animals, or to inspect goods and animals.

Public health programmes including food and water management at PoE are functioning. A safe environment for travellers includes, but is not limited to water and public washroom premises, while catering facilities are in palce but these are not sufficiently maintained.

Vector surveillance at PoEs and facilities around PoEs are in place as part of national entomology surveillance, but are not maintained due to shortage of resources. Vector control measures are implemented based on the results of vector surveillance, when implemented.

A public health contingency plan for all hazards is in place for the designated airport only. The plan includes procedures to deal with ill travellers. An isolation area is easily reachable through an external or internal emergency way. The isolation area is spacious and can accommodate a large number of ill passengers and their companions. Ill passengers can stay in this area up to 24 hours with initial assessment and management capacity until referred to a health facility. Quarantine space for animals is not in place at PoE, and time did not permit the JEE mission team members to evaluate the transportation capacity of animals to the quarantine space within the country. The designated port has the capacity to issue ship sanitation certificates as per the IHR model.

Recommendations for priority actions

- Revise the list of designated PoEs, and expand their role to adopt a risk assessment approach. Share the list of designated PoEs with WHO and develop a plan to build IHR requirements at newly designated PoE.

- Enhance the capacity of personnel at each PoE for inspection of goods and animals and for the early detection and management of ill passengers, through continuous training programmes and simulation exercises with the involvement of the relevant sectors.

- Improve the capacity of public health and environment programmes at PoEs.

- Ensure the sustainability and integration of PoEs and facilities around them in the vector surveillance and control programme.

- Establish animal quarantine space at PoEs. Sudan has 32 quarantine spaces for animals at the different PoEs including between states to monitor their movement. Trained veterinarians exist at these quarantine spaces, although some of them are not properly equipped for animal checking/testing.

Indicators and scores

PoE.1 Routine capacities are established at points of entry

Score 3: Developed capacity. The designated airport and port have access to equipment and personnel for the transport of ill travellers to an appropriate medical facility. An inspection programme for a safe environment is in place but not well maintained. While the PoE and facilities around them are part of vector surveillance and control, the programme is not well maintained for lack of resources. IHR capacities at the designated ground crossings are not well established.

Strengths and best practices

- Strong coordination and communication exist between the different stakeholders at PoEs, and between the public health and security sectors at all ground crossings.

- Communication lines with other international PoEs are in place. SOPs for communication between conveyances and competent authorities concerning ill passengers are also in place.

- Access to medical facilities at PoEs and referral arrangements to other health facilities are in place, as well as an isolation area for ill passengers with direct access to referral facilities.

- The IHR health part of the aircraft general declaration, the maritime declaration of health, and the IHR model for ship sanitation certificates are used at PoEs.

- Regular meetings take place with neighbouring countries to address cross-border public health issues.

Areas that need strengthening/ challenges

- Environmental, routine public health, and inspection programmes for imported goods are in place but not well maintained, and personnel do not have continuous training to carry out the inspection programmes.

- A vector surveillance and control programme has been established, including at PoEs and facilities around them; however the programme is not well maintained due to a shortage of resources.

- The designated ground crossing does not have rapid access to medical facilities. Also, trained personnel are not sufficient for the early detection, assessment and initial management of ill passengers.

- Other ground crossings in the country are not designated for IHR implementation; however they involve heavy movement of traffic including nomads, which generates a high risk for the national (between states) and international spread of disease.

PoE.2 Effective public health response at points of entry

Score 2: Limited capacity. A contingency plan for responding to public health emergencies of all hazards is in place at the designated airport and port, but not at any other international PoE. Animal quarantine spaces exist but some of them are not properly equipped.

Strengths and best practices

- The public health contingency plans for the designed port and airport were developed with the involvement of all relevant stakeholders. The plans are integrated components of the emergency plans, and updated versions will be disseminated during 2017.

- Facilities for assessing potentially contaminated/infected travellers are available at the designated port and airport. A space to isolate ill passengers from other passengers is available at the designated airport.

Areas that need strengthening/challenges

- The public health contingency plan needs to be developed and tested for the other international PoEs with the involvement of relevant stakeholders at each PoE. SOPs for the early detection, assessment and management of ill passengers and infected animals need to be developed and annexed to the plan. The SOPs for the management of suspected Ebola cases can serve to cover other public health events.

- Animal quarantine services exist at all PoE but some are ill-equipped to hold animals for inspection/testing. Hence, animals are transported to quarantine spaces inside the country. However, maintaining their safe transport to minimize the risk of transmission of infection is highly challenging.

- A quarantine space for ill passengers does not exist at the designated port and ground crossings, or at other PoE. Medical facilities are not easily accessible for ill passengers travelling through ground crossings.

Relevant documentation

- Emergency plan for Khartoum international airport.

- Public health emergency preparedness for public health events for Khartoum international airport and Blue Nile Port.

Chemical events

Introduction

States Parties should have surveillance and response capacity for chemical risks or events, including effective communication and collaboration among relevant sectors. While there are many similarities between chemical events and other IHR-relevant hazards, there are also certain unique aspects that need to be borne in mind when considering the capacities required to meet the IHR target. As chemicals are ubiquitous, a broad spectrum may be involved in a chemical event and the whole life cycle needs to be considered. While radiological events are a separate IHR-related hazard, certain radioactive materials may have serious toxic effects due to their chemical components and be more hazardous from this than from their radiation. Air- and waterborne chemicals, including soil and food contamination may be involved, which can have both internal and international/transboundary impacts. Contamination of pharmaceuticals, as well as exposure to natural toxins, may be involved in chemical events. While acute toxic effects may be of primary concern, chronic and long-term effects may also need to be considered in terms of capacity to deal with chemical events. Borders may be porous making it difficult to define precisely "points of entry". Moreover, chemical events of airborne origin may have quite broad entry points. Similar considerations apply for marine, international waterway and offshore chemical events.

Target

States Parties should have surveillance and response capacity for chemical risk or events. It requires effective communication and collaboration among the sectors responsible for chemical safety, industries, transportation and safe disposal.

Sudan level of capabilities

Sudan is a large user of chemicals, particularly in the agricultural and health sectors, but which are managed in a piecemeal fashion. While the basic legislative infrastructure is largely in place for the response to events of chemical origin, complementary regulations for control of chemicals and hazardous substances produced intentionally or unintentionally are lacking. Pharmaceuticals are specifically regulated but, apart from pesticides, existing legal measures do not address the whole life cycle of chemicals. Legislation for the control of toxic chemical waste is also inadequate.

Sudan has a national chemicals management profile (2005) that should to be regularly updated. A chemicals safety policy and a national strategy and action plan for implementing the Strategic Approach to International Chemicals Management (SAICM) were prepared in 2011, but comprehensive implementation is lacking. Sudan has ratified the Basel, Paris, Rotterdam and Stockholm Conventions, and is progressing towards ratification of the Minamata Convention on Mercury. A national plan to implement the Stockholm Convention on Persistent Organic Pollutants has been prepared. The Amendment to the Basel Convention has not been ratified or incorporated into legislation on toxic waste. The International Labour Office (ILO) Conventions 170 and 174 are not in force.

Some guides and procedures for sound chemical management have been elaborated, but are only partially implemented. Capacity-building is needed to ensure implementation of the multilateral environmental agreements. There is some access to international databases relating to chemicals (e.g. INTOX and INCHEM). Environmental monitoring of air and water is partially in place; surveillance for other media is weak and does not cover the whole country.

OTHER

An interministerial Committee for Chemicals Management has been proposed but is not yet fully functioning with an operating budget. Coordination with other IHR sectors is partial and financed mechanisms for consultation concerning chemical events among stakeholders and communication of chemical risks need strengthening. There remains a lack of awareness concerning chemical risks and chemical events and poor appreciation of the implications for response to chemical emergencies at decision-maker level, particularly in some regions.

Educating the public and awareness concerning chemical risks are lacking and programmes to identify and minimize them, along with actions to respond to emergencies, and strengthening of human resources, are required. Further training of personnel in chemical risk assessment and communication is desirable; as well as improved training on chemical events by first responders and the medical professions. Often, medical professionals have poor knowledge on the diagnosis and patient management of diseases of chemical aetiology.

Good laboratory capacity for identifying chemical risks with SOPs exists at the national level, particularly in relation to forensic cases, but analytical toxicology capacity for exposed patient diagnosis and treatment remains weak at most hospitals, particularly at the peripheral level. A meaningful dialogue between the treating physicians and analytical toxicologists working at the laboratories is frequently lacking for chemical exposure cases. Ensuring access to pharmaceuticals and medical supplies for chemical emergency response is not fully in place.

A national centre for toxico- and pharmacovigilance that provides 24/7 identification and surveillance of chemical risks, particularly acute exposures, with systematic collection of case data, is urgently needed. Capacity for identification and surveillance of chemical risks from chronic exposure, that may develop into chemical events, needs to be developed. Capacity exists to identify chemical risks associated with food contamination, although there is a need to strengthen capacity for analysis of clinical toxicological samples, as well as chemical samples in environmental media.

The health sector cooperates with the emergency services (coordinated through the Ministry of Interior) for preparedness and response to IHR-related chemical events and their notification. However, important gaps remain in transparency; systematic, harmonized data collection and exchange of information on chemical events occurring throughout the country, and their management. Regular analysis of information is also lacking, which would allow learning from past experience and epidemiological follow-up.

Few industrial installations have chemical emergency preparedness and response plans that cover the inside and outside of the plant. An inventory of potential chemical risk sites in Sudan and mapping of potential hazards needs to be prepared and regularly updated. The risks involved should be evaluated and communicated to relevant decision-makers throughout the country for specific action. There is no system for registering or tracking hazardous chemical consignments entering the country. Comprehensive chemical emergency plans need to be developed with SOPs and regularly tested and improved through simulation exercises.

Recommendations for priority actions

- Establish a legally constituted, budgeted national interministerial commission on chemical events.
- Establish a poisons information centre and related medical and analytical facilities operating 24/7 with systematic data collection.
- Strengthen analytical toxicology laboratory facilities, with the creation of a regional network of accredited laboratories.
- Train chemical emergency response personnel, including health professionals and organize simulation exercises.

- Strengthen national chemical safety programmes and their implementation in accordance with multilateral chemicals and waste agreements.

Indicators and scores

CE.1 Mechanisms are established and functioning for detecting and responding to chemical events or emergencies

Score 1: No capacity. The surveillance systems in place for chemical events are fragmented among institutions, with inadequate identification of intoxications and incomplete laboratory capacity for confirmation of events occurring throughout the country. Response capacity to events is weak.

Strengths and best practices

Sudan has some capacity for identifying chemical risks in certain areas of the country by different national institutions. The lack of real-time exchange of information among relevant stakeholders, an inadequate surveillance system for chemical events and their reporting, as well as the lack of coverage for the whole country, are factors on which this score is based.

Areas that need strengthening/ challenges

- Coordination for surveillance and detection of events needs to be strengthened as responsibilities are divided among several sectors with insufficient exchange of information.
- A programme that evaluates health risks of chemical origin throughout the country needs to be established.
- An inventory of potential chemical risk sites and mapping of potential hazards needs to be prepared and regularly updated, evaluating the risks involved in chemical events, and communicating these to relevant decision-makers throughout the country for specific action.
- A system for tracking important hazardous chemical consignments entering the country, and registration and tracking capacity, needs to be developed.
- Laboratory capacity, qualified human resources and finances remain insufficient.

CE.2 Enabling environment is in place for management of chemical events

Score 2: Limited capacity. A national policy, action plans and legislation, albeit fragmented, for surveillance, alert and response to chemical events exist.

Strengths and best practices

- Surveillance for chemical events is not complete and does not cover the whole of the country, and a comprehensive national plan for the management of such events does not exist.
- Legislation is in place or in preparation but, apart from regulation of pesticides, is fragmented and does not cover the whole chemical life cycle and does not guarantee access to information. Pesticide residue limits for food are in place.
- In the case of serious chemical events, funds can be immediately mobilized.

Areas that need strengthening/ challenges

- A comprehensive health plan for chemical incidents should be developed, with regular evaluation and effective coordination for surveillance, preparedness and response.

OTHER

- A national toxicovigilance (poisons information) centre and related analytical and clinical facilities needs to be established with networks in all regions, with systematic collection of case data in harmonized forms.

- Capacity for health risk evaluation and communication of risks needs strengthening. Training of medical personal in diagnosis and management of chemicals events should be undertaken, using simulation exercises.

Radiation emergencies

Introduction

States Parties should have surveillance, assessment, notification, reporting and response capacities for radiological public health hazards, events or emergencies of international concern. This requires effective collaboration and communication among state organizations with responsibilities in radiation emergency management.

Target

States Parties to have surveillance and response capacity for radionuclear hazards/events/emergencies with effective communication and collaboration among the sectors responsible for radionuclear management.

Sudan level of capabilities

Current regulation and guidance on radiation protection in Sudan dates from 1996. The Nuclear and Radiation Activities Regulatory Control Bill of 2015 is expected to be passed by Parliament in 2017. The Sudanese Nuclear and Radiological Regulatory Authority (SNRRA) was established by ministerial decree in 2010 as the national regulator, and the above bill will delineate further its responsibilities.

Sudan is party to the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency, the Convention on Early Notification of a Nuclear Accident, as well as a number of other important conventions and treaties concerning the safe and peaceful use of nuclear energy. The SNRRA is the competent authority for emergency preparedness and response concerning nuclear and radiological emergencies. It is also the focal point for the WHO Radiological Emergency Medical Preparedness and Assistance Network (RANET) to which it became a member in 2014.

Higher level legislation is being passed in Parliament and the corresponding regulation and guidance is being drafted. Thus the regulatory basis to manage radiological emergencies will be established when documents defining the activities have been prepared. The challenge to implement the plans and regulations and put them into practice remains.

A hazard assessment was made a few years ago as a basis for planning preparedness and response for a radiological emergency, commensurate with the hazards identified. The highest hazards in Sudan are category III sealed sources used in hospitals and industrial applications. Emergencies concerning these sources could require on-site or local protective actions. A national plan for response to nuclear and radiological emergencies has been drafted, and the national public health emergency response plan includes medical response to radiation emergencies. Emergency exercises await the development of further plans and procedures on emergency response for the involved organizations.

Operations of the national committee for managing radiation and nuclear emergencies (under the National Council for Civil Defence) are being planned by a preparatory group representing all relevant organizations.

The SNRRA has an organizational structure, 24 technical staff, and core capabilities needed in emergency situations such as use of the services of the Sudan Atomic Energy Commission. The human and financial resources of the regulator are inadequate and it suffers from high staff turnover due to competitive work opportunities abroad. It also faces the challenge of increasing its competences and capabilities while the nuclear energy programme in Sudan and those in the region advance, with increasing demand for experienced experts. Hurdles for effective operation also include the low number of necessary experts and equipment, and the lack of an emergency centre with reliable communication to emergency centres of the FMoH and the Civil Defence.

OTHER

Recommendations for priority actions

- Adopt and implement the national radiation emergency plan, with procedures, training programmes and exercises.

- Designate a hospital with equipment, trained personnel and guidelines to manage patients contaminated with radioactive substances and those with overexposure.

- Establish a national emergency centre for radiological emergencies within the SNRRA.

Indicators and scores

RE.1 Mechanisms are established and functioning for detecting and responding to radiological and nuclear emergencies

Score 2: Limited capacity.

Strengths and best practices

- Radiation hazards have been assessed according to International Atomic Energy Agency (IAEA) technical documents, and classified in the emergency preparedness categories defined in its Safety Standards Series No. GSR Part 7.

- The SNRRA has been established as the regulatory agency with primary responsibility for radiation safety.

- A system of control of consumer products is functioning.

- Laboratory capacity to detect samples for radioactivity is used for environmental safety and consumer product control.

Areas that need strengthening/ challenges

- There is a high turnover of personnel in SNRRA and the Sudanese Atomic Energy Commission.

- Minimum measurement and laboratory equipment is available for radiological emergencies.

- Arrangements are not in place for the appropriate medical care required in radiological emergencies.

RE.2 Enabling environment is in place for management of radiation emergencies

Score 3: Developed capacity. A radiation emergency response plan exists (could be part of the national emergency response plan) and national policies, strategies or plans for national and international transport of radioactive material, samples and waste management including those from hospitals and medical services are established.

Strengths and best practices

- A national public health emergency response plan for medical response to radiation emergencies exists, and a plan for response to radiation and nuclear emergencies has been drafted.

- A national committee for management of radiological and nuclear emergencies is being formed under the National Council of Civil Defence.

Areas that need strengthening/ challenges

- Neither the national public health emergency response plan for medical response to radiation emergencies or the plan for response to radiation and nuclear emergencies have been implemented.

- The national committee for management of radiological and nuclear emergencies is not yet functional, although a preparatory committee of relevant stakeholders is planning its activities and operations.

Annex 1: JEE background

Mission place and dates

The mission took place in Khartoum, Sudan on 9–13 October 2016. The team held multisectoral discussions and site visits in the capital city of Khartoum.

Objectives

a) Assess implementation of the IHR capacities for surveillance and response to public health events including at points of entry.

b) Review all related documents.

c) Develop a report describing the progress and gaps in implementing the IHR capacities.

d) Recommend priority actions to update and finalize the national plan to achieve and maintain IHR capacities for global health security.

Limitations and assumptions

Assumptions

- The results of this assessment will be made publicly available.

- The assessment is not an audit, and while information provided by Sudan was cross-checked and validated by the team as far as possible, not everything could be independently validated.

- This is a peer-to-peer review. Information provided by Sudan was discussed and an assessment rating was mutually agreed between the host country and assessment team.

Limitations

- The one-week assessment limited the amount and depth of information that could be managed.

- An acute watery diarrhoea outbreak during the evaluation, couple with a physicians' strike limited the involvement of some senior officials due to their involvement in these events.

- Some background documents were only available in Arabic. While some Arabic-speaking external experts could provide a summary to the other experts, a review of the background documents was limited.

- Evaluation meetings were conducted at the federal level. Nationals from some states participated in the discussion, although not all sectors were represented. Having all states represented in the discussion might have affected the scores, particularly as no field visits could be conducted for lack of time.

Mission team members:

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- Markos Tibbo, FAO Regional Office for the Near East and North Africa, Cairo, Egypt

- Martine Van Utterbeeck, Doctors Without Borders, Paris, France

Key host country participants and institutions

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Almuaz Altieb	General Director, Primary Health Care Directorate
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Abdelgadr FMoHamad	Criminal Evidence Laboratory
Abdelrahim Morsal	Ministry of Health, West Darfur
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Rehab Fathelrahman	National Public Health Laboratory
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Safa Hafize Almeine	Humanitarian Aid Commission

Salah Mustafa	Federal FMoH National Public Health Laboratory Occupational Health
Samia FMoHamed Madawi	Federal FMoH National Public Health Laboratory Occupational Health
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Sumaia Abdel Nabi	Ministry of Media Sudan News Agency
Tagwa Abdalla Osman	Federal FMoH Health Quarantine
Tagwa Idriss Briema	FMoH North Darfur
Tahni Adam Mahdi	Federal FMoH Health Quarantine
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Samah Ali FMoHamed Alhussien	Federal FMoH IHR Department
Yahia Ali Sabiel	National Public Health Laboratory
Dina Abdalhameed	Federal FMoH IHR Department

Supporting documentation provided by Sudan

- Self-reporting on JEE assessment tool, Sudan.

- Presentation on overview of the health system in Sudan (JEE assessment mission, 9 October 2016).

- Technical area presentations on each of the 19 technical areas of the JEE tool (9–13 October 2016).

- Online repository of supporting documents, notifications, data sources, previous assessments and web links for the 19 technical areas of the JEE tool.

National legislation, policy and financing

Relevant documentation

- International Health Regulations (2005), World Health Organization, 3rd edition.

- Joint External Evaluation Tool, International Health Regulations (2005), 2016.

- 2005 Constitution of the Republic of the Sudan.

- 2014 Ministerial Decree establishing the Sub-National Committee to review legislation relevant to IHR implementation.

- Report of the Sub-National Committee following the 2014 legislative assessment.

IHR coordination, communication and advocacy

Relevant documentation

- NFP Guidelines and Terms of Reference.

- Decree for the establishment of IHR multisectoral Committee and IHR Technical Committee.

- Technical Committee membership listing.

- List of technical area focal points.

- Report on Evaluation of Core Capacities for Surveillance and Response in Sudan for the Implementation of IHR Annex (1A), 2010.

Antimicrobial resistance

Relevant documentation

- Country Capacity Review Mission for Early Implementation of AMR Surveillance in Sudan (16–19 May 2016): Executive Summary, including roadmap for AMR surveillance – GLASS.

- National IPC Plan.

- National IPC Manual.

- Sudan National Standard Treatment Guidelines.

- Antimicrobial Policy.

- National Essential Medicines List.

- National Medicines Policy.

- Elhag KM. Diversification of antibiotics as a means to control antimicrobial resistance and improve treatment options in Sudan (Sudan Med J 2013).

- Elmadiena MM et al. Antimicrobial susceptibility and multi-drug resistance of Salmonella enterica subspecies enterica serovars in Sudan. Trop Anim Health Prod. 2013:45(5):1113-8.

- Eltayb A, Barakat S, Marrone G, Shaddad S, Stålsby Lundborg C. Antibiotic use and resistance in animal farming: a quantitative and qualitative study on knowledge and practices among farmers in Khartoum, Sudan. Zoonoses Public Health. 2012;59(5):330–8.

Zoonotic diseases

Relevant documentation

- Memorandum of Understanding between Ministry of Health and Ministry of Animal Resources and Fisheries.

- Guidelines of coordination between Ministry of Health and Ministry of Animal Resources and Fisheries 2016 (draft).

- Zoonotic state councils formation orders (4).

- List of zoonosis focal persons from Ministry of Health and Ministry of Animal Resources and Fisheries (36).

- Integrated mission reports (5).

- Joint training workshop reports (4).

- National Health Emergency Plan (2014).

- Zoonosis surveillance guideline (1997).

- Manual of VHFs (2006).

- Sudan One Health concept paper (draft).

- Epidemiology plan 2012–2016, including rabies and brucellosis control programme.

- SOPs of zoonosis (2014).

- HPAI contingency plan 2006.

- STOP Avian Influenza training manual.

- Avian influenza simulation exercise.

- Veterinary governance document.
- MERS-CoV workshops report.
- Priority diseases control plans and action plans.
- OIE PVS pathway.

Food safety

Relevant documentation

- 1. Food inspection manual.
- 2. Foodborne diseases surveillance draft.
- 3. Food control law 1973 and regulations.
- 4. SOP of Food Safety Control System for exported and imported foods.
- 5. Decision of committee formation.

Biosafety and biosecurity

Relevant documentation

- National Lab Policy, Sudan.
- TOR-NWLG.
- National Laboratory Strategic Plan 2016–2020.

Immunization

Relevant documentation

- Annual plan based on national strategic plan.
- Cold chain SOPs and guidelines.
- Annual report for routine immunization.
- Reports system guidelines.
- Microplans for routine immunization.
- Supervisor checklist for routine immunization and surveillance.
- Monthly, quarterly and annual reports.
- WHO and UNICEF Joint Reporting Website.
- Country presentation to the WHO EMR measles intercountry meeting, November 2015.
- EMR periodic bulletin (cumulative indigenous measles/rubella case counts and surveillance indicators).

National laboratory system

Relevant documentation

- National Lab Policy, Sudan.
- TOR-NWLG.
- National Laboratory Strategic Plan 2016–2020.

Real-time surveillance

Relevant documentation

- Establishing Integrated Disease Surveillance and Response in Sudan, Final Report of WHO Technical Mission (2–15 February 2014), 31 March 2014.

- FFMoH, Epidemiology & Zoonotic Diseases Department Strategic Plan 2012–2016, June 2011.

- FFMoH, Draft Standard Operating Procedures for Event Based Surveillance, 2016.

- FFMoH, Draft Technical Guidelines for Community Based Surveillance System in Sudan, 2016.

- FFMoH, Draft Standard Operating Procedures for Community Based Surveillance System Volunteers in Sudan, 2016.

- Report on "Assessment of public health core capacities of the international health regulation (IHR)", Sudan, 10–13 February 2014, WHO EMRO.

- FFMoH, Guidelines for Communicable Disease Surveillance in Sudan, 2013.

- FFMoH, Hepatitis E management protocol, 2013.

- FFMoH, Guidelines, SOPs and management protocol for Meningitis, 2013.

- Early detection, assessment and response to acute public health events: Implementation of Early Warning and Response with a focus on Event-Based Surveillance. WHO/HSE/GCR/LYO/2014.4, www.who.int/ihr/publications/WHO_HSE_GCR_LYO_2014.4/en/.

Reporting

Relevant documentation

- Periodic surveillance reports communicated with IHR-NFP and other relevant departments.

- List of Notifiable Diseases Group A and B.

- Surveillance Strategic Plan, Annual Plan and Monthly progress reports.

- GPRM/CSR Biennial Plan with stakeholders (WHO).

- UNICEF Annual Plan.

- EBS SOPs and Guidelines (drafted).

- OIE weekly and monthly reports.

- National Command Centre (EOC) SOPs and Guidelines.

Workforce development

Relevant documentation

- Epidemiology strategic plan (2012–2016).

- Framework on Health-Workforce for Emergency and Humanitarian Response.

- National human resources for health strategy (2012–2016).

- Draft health sector strategic plan (2017–2020).

Preparedness

Relevant documentation

- National Health Emergency Response Plan 2014.
- Health Emergency and Disaster Risk Management Strategy for Sudan.
- State Risk Profile.
- IHR 2005 country report 2010.
- Health sector contingency plan.

Emergency response operations

Relevant documentation

- Evaluation of Core Capacities for Surveillance and Response in Sudan for the Implementation of Annex 1A. IHR 2005 Country Report 2010.
- National Preparedness and Response Plan 2015.
- EOC National SOPs 2016.
- EHA progress report 2015.
- SOPs on management and transport of potentially infectious patients.
- The Emergency and Humanitarian Action Policy.

Linking public health and security authorities

Relevant documentation

- Presidential and ministerial decrees.
- Minutes of coordination meetings.
- National Response Plan.
- SOPs for coordination of joint response to public health and other emergencies.
- MoU between Public Health and Security Authorities.
- Table-top exercise report.

Medical countermeasures and personnel deployment

Relevant documentation

- National Health Emergency Plan.
- Human resources for emergency national plan.
- National Medicines and Poisons Act.
- Sudan Medical Council Law.
- Sudanese Medical Profession Council Law.
- Humanitarian Aid Commission Regulations.

Risk communication

Relevant documentation

- Sudan IHR Self-Assessment Report 2014.

- Report on Assessment of Public Health Core Capacities of the International Health Regulations (2005), Sudan, 10–13 February 2014, WHO Regional Office for the Eastern Mediterranean.

- National Risk Communication Plan 2016.

- Health Promotion Strategic Plan 2006–2010.

- Health Promotion Strategic Plan 2012–2016.

- Annual Health Promotion Report 2015.

- Annual Health Promotion Report for Darfur 2015.

- National Health Emergency Response Plan 2014 (Part 1 and 2).

- Strategic Plan for Livestock Risk Management Communication, Ministry of Animal Resources.

- FMoH information bulletins to the media on the following topics:

  ○ Vector control campaigns
  ○ Prevention of acute watery diarrhoea
  ○ Prevention of Guinea worm
  ○ Cholera vaccination campaign for refugee populations coming from South Sudan
  ○ Water and sanitation in Khartoum State.

Points of entry

Relevant documentation

- Emergency plan for Khartoum international airport.

- Public health emergency preparedness for public health events for Khartoum international airport and Blue Nile Port.

Chemical events

Relevant documentation

- Sudan National Chemicals Management Profile, August 2011.

- Legal Frame Work (1): Current Laws and Regulations for the Management of Chemicals in Sudan; (2) Towards a Sustainable and Integrated Legal Regime for the Management of Chemicals in Sudan, August 2011, SAICM/HCENR/UNIDO.

- Interministerial Coordination Committee for Chemicals Management. August 2011, SAICM/HCENR/UNIDO.

- Inventory of Existing Chemicals, August 2011, SAICM/HCENR/UNIDO.

- National Plan for SAICM Implementation, August 2011, SAICM/HCENR/UNIDO.

- Sudan National Implementation Plan for the Stockholm Convention, November 2014.

Radiation emergencies

Relevant documentation

- Nuclear and Radiation Activities Regulatory Control Bill, 2015.

- MoU with the Custom Authority.

- Draft National Radiation Emergency Response Plan.

- Public Health Emergency Response Plan.

- Atomic Energy Law 1995.

- Radiation Protection Regulations 1998.