Risk as catalyst for positive change: lessons learnt from public health readiness for cholera in Jordan


INTRODUCTION

In 1817, cholera spread from its ancestral home in Bengal to the rest of the world, an event referred to today as the ‘first pandemic’. In 2023, about 200 years later, the world is facing what is called the ‘seventh pandemic’ which originated about 60 years ago in the Celebes. In early 2023, 29 countries face cholera outbreaks—the highest number on record. Eight of these countries lie in the WHO Eastern Mediterranean Region. Main drivers for the unprecedented spread globally and in the WHO Eastern Mediterranean Region are poverty, conflict and climate change.

On 19 June 2022, Iraq declared an outbreak of cholera. This was followed by an outbreak declaration in Syria on 10 September, the first outbreak since 2009. On 5 October 2022, Lebanon declared its first outbreak of the disease since 1993. In addition, Israel reported a positive water sample from the Yarmouk River, a transboundary river shared by Syria, Jordan and Israel, on its entry to Israel after taking samples on 10 November 2022.

The Hashemite Kingdom of Jordan is bordered by Syria to the north, by Iraq to the east, and by Israel as well as the occupied Palestinian territory to the west while Lebanon is geographically close. Jordan maintains strong ties with its neighbours, reflected in large volumes of cross-border travel and trade.
Proximity with regional Cholera outbreaks led Jordan to enhance its readiness towards a possible importation of cholera from neighbouring countries.

This manuscript emphasises how a heightened public health risk for Jordan translated into evidence-based policy-making, improvements of governance, and strengthened capacities and partnerships.

PUBLIC HEALTH POLICY TO PREVENT CROSS-BORDER DISEASE TRANSMISSION, GUIDED BY EVIDENCE

During outbreaks of epidemic prone diseases, governments tend to impose restrictions on travel and trade to prevent the spread and importation of disease. Often, these restrictions are not based on scientific evidence. To stop such unscientific restrictions for cholera, the International Health Regulations (IHR) 1969 were modified in 1973 so that travellers would no longer be required to show a certificate of vaccination against the disease. The vaccine on which this decision was based (parenteral whole-cell vaccine) offered limited and short-term protection and did not prevent transmission of the infective agent if an individual was vaccinated. Furthermore, the 1991 WHO resolution WHA 44.6, urged Member States not to apply unnecessary restrictions to cholera-affected countries, in particular no import ban on traded goods.

In 20 September 2022, to discuss the perceived risk and priority actions against cholera importation from neighbouring countries and potential spread within Jordan, the Jordan Center for Disease Control (JCDC) called for a multisectoral meeting with the national partners, including with the Ministry of Health (MoH), the Ministry of Water and Irrigation, the Water Authority of Jordan, the Jordan Valley Authority, the Ministry of Agriculture, the Ministry of Environment, the National Center for Security and Crisis Management (NCSCM), the Jordan Drug and Food Administration, the Royal Scientific Society and Academia. The early involvement of authorities for water and environment to discuss a health situation built on established partnerships for ‘One Health’ in Jordan. These partnerships had previously discussed other health threats requiring the involvement of multiple sectors, including zoonoses such as rabies.

On 21 September 2022, JCDC called for a meeting with international partners, namely WHO, the Food and Agriculture Organization of the United Nations, the United Nations High Commissioner for Refugees (UNHCR), the International Organization for Migration (IOM) and the United Nations Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA). During this meeting, discussions centred around implications of cholera outbreaks in neighbouring countries on three pillars: personnel (travellers), food trade and shared waters. WHO provided relevant guidance on the application of the (IHR), with critical focus on measures at points of entry at the border with Syria (Box 1). These included advice against entry/exit screening at points of entry (approximately 80% of infected individuals in cholera outbreaks are asymptomatic) and limited feasibility to test every person at points of entry (stool samples are needed, results from gold standard tests may take several days). Additional advice was given against mandatory proof of vaccination against cholera for entry to Jordan. With current, oral vaccines, the recommendation was partially due to the limited global stockpiles of cholera vaccine while demand is increasing and because health measures such as provision of safe water, sanitation and hygiene (WASH) as well as surveillance are sufficient to prevent cholera from spreading within a country following importation.

To note how also advice against any restrictions on trade with countries affected by cholera outbreaks was discussed, based on evidence and decades long experience. On 18 October 2022, JCDC and MoH jointly visited the Jaber border ground crossing with Syria to assess the infection prevention and control (IPC) measures for goods handlers, recommended improvement of the sanitation facilities for staff and travellers, and emphasised the importance to adhere to the IHR guidance. Following a meeting with relevant ministries at the NCSCM on 9 November 2022, Jordan decided against the implementation of any health measures that significantly interfere with international traffic as per Article 43 of the IHR.

After the detection of a positive environmental sample in Israel, Jordanian authorities discussed the necessity for environmental sampling and for the disruption of water flow from the Yarmouk river. MoH and JCDC sought advice from international organisation and concluded that environmental sampling in the Jordanian context was not reasonable due to difficulty in interpretation. On the other hand, rigorous monitoring of drinking water quality was continued to ensure access of safe water for consumption and irrigation. During subsequent meetings with other line ministries on 14 November 2022 and 16 November 2022, Jordanian authorities led by MoH and JCDC reiterated the decision against any disruptions of water flow and environmental testing. While the decision was made not to disrupt water flows, national authorities decided to periodically conduct environmental sampling for Vibrio cholerae in fresh water and sewage.

Box 1 Summary of WHO recommendations on travel and trade at points of entry on the border with Syria, 23 September 2022.

- No embargoes or similar restrictions on trade to countries affected by cholera outbreaks.
- Advise against entry/exit screening at points of entry related to the Syria cholera outbreak.
- Advise against vaccination against cholera for entry to Jordan.
- Advise against prophylactic administration of antibiotics or proof of such administration.
TAKING ADVANTAGE OF OPPORTUNITY: TOWARDS COORDINATION AND COLLABORATION ACROSS SECTORS

In Jordan, several authorities are mandated by law to manage health emergencies (figure 1) with the latest addition being the JCDC which was established in 2020. In addition, a Public Health Emergency Operations Centre has been established in MoH Jordan in 2015 with support from the US Department of State and the US Centers for Disease Control and Prevention. MoH is the traditional lead agency for health affairs in the kingdom including for emergencies, implementation of and adherence to the IHR, for coordination and for cross-border health affairs. Legal mandates of the newly established JCDC partially overlap with those of MoH and the threat due to cholera was the first health emergency response with the involvement of JCDC. In addition, at the time of the outbreak declarations in Syria and Lebanon, MoH and JCDC were finalising their respective institutional strategies for the following years. This initially created challenges in the coordination and collaboration between both national authorities, specifically in the areas of partner coordination and laboratory support. WHO encouraged both stakeholders to coordinate efforts and to define roles and responsibilities in face of the threat of cholera.

As the risk for cholera importation and local spread persisted, the MoH assumed its leadership role for the overall health sector response towards cholera while JCDC assumed a coordinating function within the health sector, providing support to MoH. For example, JCDC convened meetings between MoH and other line ministries on sampling strategies, supported the MOH in developing a national preparedness plan, and coordinated activities around Risk Communication and Community Engagement (RCCE). The distribution of roles and responsibilities was enshrined in the National Cholera Preparedness and Response Plan, the Health Sector Cholera Preparedness and Response Plan, and the National RCCE strategy.

UN agencies provided input and support to the development of these documents, including on the complementarity and comparative advantage of both MoH and JCDC. Lessons from readiness activities for cholera on complementarity and comparative advantages of MoH and JCDC later informed the development of the respective institutional strategies.

Humanitarian coordination

Jordan has a long history of hosting refugees and asylum seekers. The IOM reports that four in 10 people living in Jordan are immigrants. This include around 650,000 Syrian refugees registered with UNHCR (according to the United Nations Children’s Fund the total number of Syrians including the non-registered is around 1.3 million) in addition to around 2 million Palestine refugees as well as refugees from other countries (67,000 Iraqis, 15,000 Yemenis and 6000 Sudanese, among others).

In consideration of the vulnerability of refugee camps and crowded settlements with non-optimal WASH provisions towards cholera importation and spread, existing and well-established Jordan humanitarian coordination platforms such as the Health Sector Working Group (HSWG) were used to share information and to coordinate activities. This included for instance the establishment of a 4W database which was updated in real time. A 4W database provides information regarding which organisation is carrying out which activities, where and when. The HSWG, co-chaired by WHO and UNHCR, brings together UN agencies, national and international Non-governmental organizations (NGOs), donors and government actors to support the provision of essential health services to all refugees, including Syrian refugees, in line with the Jordan Response Plan for the Syria Crisis. Activities and potential support were discussed with actors involved in reinforcing readiness, both in refugee camps and host communities in technical areas such as surveillance, laboratory, RCCE and others.
the HSWG as well as with UNRWA, which covers the needs of Palestinian refugees.

Cholera risk assessment
The improved collaboration between MoH and JCDC was demonstrated during the planning and conduct of a whole-of-government risk assessment on 5 and 6 December 2022, where MoH and JCDC took complementary roles with support from WHO. On 5 December 2022, MoH and JCDC, jointly with the HSWG co-chairs WHO and UNHCR, visited Zaatari refugee camp to assess the risk and readiness for a potential cholera outbreak. The visit revealed a high level of readiness including a cholera treatment centre, surge plans and referral links to the national health system, guided by a cholera camp plan jointly developed by humanitarian agencies and the Mafraq health directorate. Areas in need of further support included WASH, data collection, surveillance and surge capacity. On 6 December 2022, 45 specialists from government and partner agencies participated in a workshop to determine the likelihood and impact of a possible cholera importation and local spread and to define priority actions across response pillars. Information gathered during the camp visit further informed the discussions. Country preparedness and readiness capacities were assessed as strong.

The risk assessment followed an established WHO methodology. Participants were divided into specialist subgroups covering their respective technical areas including RCCE, surveillance, WASH, laboratory capacities and coordination. For each area, groups defined subelements to evaluate capacities. For surveillance as an example, these subelements covered the functioning of an event-based surveillance system, case definitions, functioning of epidemiological Rapid Response Teams, and the identification of high-risk areas, among others. Groups assigned a weight (one for lowest; five for highest importance) to each subelement to measure its importance for likelihood and impact. Participants were then redistributed into multisectoral groups and each group agreed on a score (one for no capacities, five for strongest capacities) for each subelement of every technical area under the guidance of an expert. Subelement scores from each group were compiled to calculate a percentage score for each technical area, taking into account the weighting. The average of the technical area scores from each group were then compiled and a final score calculated for likelihood and impact.

Scores indicated the likelihood of importation as ‘possible’ due to the movement of people across borders with Syria and Iraq and the high proportion of asymptomatic cases. The impact of local spread in case such an event occurred was evaluated as ‘minor’ (figure 2). Priority actions were then defined to further decrease likelihood and impact. These actions informed further activities, among them the establishment of a national RCCE working group and trainings on case management.

The heightened risk of cholera importation from neighbouring countries and local spread was a catalyst to strengthen coordination and collaboration across sectors towards better health emergency governance and overall preparedness. Established humanitarian coordination structures were helpful to rapidly initiate coordination among partners. The experiences during the readiness phase for cholera in Jordan also benefitted the strategy developments of both MoH and JCDC to assume

Figure 2 Risk matrix showing estimated likelihood and impact of cholera importation and local spread in Jordan.
complementary and mutually beneficial roles in public health emergency management.

SUSTAINABLE STRENGTHENING OF CAPACITIES

Health crises can serve as catalyst for positive change as exemplified during the COVID-19 pandemic in Jordan and globally.\textsuperscript{28–31}

Laboratory

Jordan has a strong laboratory network which was showcased during the COVID-19 pandemic where the maximum capacity to perform molecular COVID-19 tests was estimated to reach 574,441 per week.\textsuperscript{32} Yet, the country’s last experience with cholera dates back to 1981.\textsuperscript{33} In order to strengthen laboratory capacities for Vibrio cholerae detection, several actions were spearheaded by the national health authorities, such as the procurement of laboratory reagents for the Jordan Central Public Health Laboratory (CPHL), development of testing protocols and trainings of laboratory technicians from all governorates for the diagnosis of Vibrio cholerae and the subsequent testing for the epidemic-prone strains O1 and O139. With support from WHO, CPHL established a relationship with Institut Pasteur in Paris, a WHO Collaborating Centre laboratory which cross-checked human and environmental samples tested negative at CPHL and confirmed results. The relationship between CPHL and Institut Pasteur may allow for additional capacity strengthening to establish testing for toxigenicity of O1 or O139 positive strains in Jordan and for further shipments of samples in case of a suspected outbreak in Jordan.

Risk Communication and Community Engagement

As a result of the national risk assessment conducted on 6 December 2022, a working group was formed by JCDC to strengthen RCCE coordination and collaboration for cholera across sectors, JCDC and MoH, with the support from UNICEF and WHO held a workshop on 16 January 2023 to establish the terms of reference for the working group, modelled on a whole-of-government committee that had been in place during the COVID-19 pandemic and had supported the COVID-19 national campaign ‘Elak O Feed’ (For you and your benefit).\textsuperscript{34} The working group under the leadership of MoH and with JCDC as a secretariat will coordinate RCCE efforts and develop messaging for all-hazard health threats beyond cholera, including risk factors for non-communicable diseases, the largest contributors to disease burden in Jordan.\textsuperscript{35} Furthermore, the working group is currently tasked in developing the national RCCE strategy.

Case management and IPC

In response to another gap identified during the risk assessment, WHO in close collaboration with the MoH Hospital Administration developed a webinar on cholera case management and IPC. The webinar was held on 13 January 2023 and brought together 55 healthcare professionals from hospitals and primary healthcare centres across all governorates in Jordan as well as experts from MoH, JCDC and other partners. The information provided on electrolyte and fluid management, intensive care, the setup of treatment centres for infectious diseases and IPC can be applied for diseases beyond cholera.\textsuperscript{36} A partnership between WHO and the MoH Hospital Administration has since been established and organises webinars for healthcare providers, including on airway and trauma management.

Cross-border collaboration

On 8 November 2022, WHO proposed to the Jordan authorities the establishment of a working group to foster cross-border collaboration, addressing public health threats under the IHR (Articles 21 and 57). The goal of this working group between Jordan and neighbouring countries is to improve capacity at points of entry, to enhance information sharing, early detection, joint investigation and response to public health events of mutual concern.

Meanwhile, MoH, JCDC and IOM jointly prepared a PoE emergency preparedness and response plan for all health hazards, including cholera.

In summary, the persistent risk of cholera importation and local spread has led to several initiatives, working groups and partnerships that will have positive effects on the national and regional preparedness and response to health emergencies, including but not limited to cholera.

CONCLUSION: IMPLICATIONS AND LESSONS LEARNT

Despite increased testing of acute watery diarrhoea cases in Jordan for cholera, no cases have been detected while outbreaks in neighbouring countries continue. Environmental samples analysed early in the readiness phase were also negative. Importation of cases cannot be prevented while maintaining open borders, mainly because of the high proportion of asymptomatic cases.\textsuperscript{16} Yet, authorities in Jordan as well as health sector partners are convinced that Jordan has made significant progress in readiness, not only for cholera but for all-hazards. Jordan is now well prepared to limit the impact of a potential importation and local spread of cholera. Factors that contributed to this level of preparedness were discussed in this paper.
Health emergencies can create opportunities to strengthen the health sector. As during the COVID-19 pandemic, Jordan has leveraged a looming threat to generate positive change. National authorities followed an evidence-informed approach towards policy-making and adhered to international law, improved the governance of the national public health emergency management system, strengthened national laboratory capacities, trained the healthcare workforce on case management and IPC and established working groups which will prove beneficial for the future. Especially for collaboration and coordination, which is key for the response towards health threats including cholera, risk was a powerful driver to improve partnerships.37

Transparent and open communication with all stakeholders was crucial to leverage expertise of international as well as national institutions; this was also possible due to a well-established relationship built on trust with health authorities during peace time, the right timing for proposals on the establishment of committees and working groups, and technical expertise. Previous multi-sectoral collaboration of authorities in Jordan towards health challenges like rabies within the framework of ‘One Health’ proved beneficial for the Jordan whole-of-government response to the cholera threat early on, specifically in areas of water and agriculture.12–14 This reemphasises the importance of the prevention and preparedness pillars of the emergency cycle to establish coordination mechanisms in peace time which can then be leveraged during times of crises.38 A comprehensive whole-of-government approach towards health emergencies is also part of the Universal Health and Preparedness Reviews, a recently launched Member State-led peer review mechanism, which aims to establish a regular intergovernmental dialogue between Member States on their respective national capacities for health emergency preparedness.39 40

Other countries and health partner agencies can learn from the Jordan experience how to leverage health crises as drivers for positive change for the health sector. The capacities built during the cholera readiness phase as well as collaboration between ministries and health authorities in Jordan and between Jordan, Lebanon and Syria will have sustained benefits for health security in Jordan and in the WHO Eastern Mediterranean Region.

Contributors CP, ABM and SB conceived the study, developed the methods, compiled the data, and contributed to the first draft of the manuscript. MA, MNA, LA, MH, RE-A, MS, RA-Q, RAA-S and FIA-H contributed to the discussion and drafted the first version of the manuscript. All authors contributed to revising and editing the manuscript. All authors approved the final draft of the manuscript, had full access to and verified all the data in the study, and had final responsibility for the decision to submit for publication.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Christian Popescu http://orcid.org/0000-0002-7794-0274
Saverio Bellizzoni http://orcid.org/0000-0002-4119-0803

REFERENCES
2 World Health Organization. WHO regional director’s statement on cholera outbreaks; 2022.
10 World Health Organization. Revision of the International Health Regulation, Available: https://www3.paho.org/english/dda ais/be_v24n4-1 IHR.htm
The 4W database was designed, in which

Explanation of the 4W mechanism. UN OCHA, A


2021;99:611.

Cov-


68511_nationalnaturaldisasterriskreduction.pdf


ion28englishedition.pdf


Bellizzi S, Aidyralieva C, Alsawhala L, et al. Vaccination for SARS-


www.who.int/europe/emergencies/emergency-cycle
