



**Fifth meeting of the Initiative against Diarrheal & Enteric diseases in
Asia- IDEA**

Hanoi 6-9 March 2017

Meeting Report

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Background

The Initiative Against Diarrheal and Enteric Diseases in Asia (IDEA) was born in 2011 in order to facilitate and support the implementation of relevant prevention and control interventions on water, sanitation and hygiene (WASH), by sharing information and best practices among participating countries and to raise awareness on the country specific cholera situation.

The fifth IDEA meeting took place in Vietnam (Hanoi, 6-9 March 2017). Representatives from 10 countries (Bangladesh, Cambodia, India, Indonesia, Malaysia, Nepal, Philippines, Pakistan, Thailand, and Vietnam) together with representatives of the World Health Organization (WHO), the US National Institutes of Health, International Vaccine Institute, Agence de médecine préventive (AMP), NGOs (Save the Children), and UNICEF participated in the meeting.

The meeting, organized by the Fondation Mérieux, included presentations, discussions and two workshop sessions.

Overview of up-to-date diarrheal disease burden in Asia

The meeting opened with a presentation on the burden of diarrheal diseases in Asia.

The annual number of childhood (0-4 years) deaths from diarrheal disease in low and middle income countries (LMIC) has dropped significantly from more than 4 million in 1980 to 526,000 in 2015 [Keusch 2016; Liu 2016]. However, diarrheal diseases continues to remain a leading killer of young children, Sub-Saharan Africa and South Asia accounting for 90% of the total. Overall, 72% of the diarrhea-related deaths occur in the first two years of life [Keusch 2016]. Fortunately, mortality due to diarrheal diseases in South East Asian Region (SEAR) has shown a significant decreasing trend since the nineties. The major interventions contributing to the observed reduction in diarrheal disease mortality are shown in Table 1.

Table 1: Interventions for diarrheal diseases

Category	Options
Therapeutic	<ul style="list-style-type: none">➤ Oral rehydration solutions (ORS)➤ Antimicrobial for bloody diarrhea or dysentery➤ Nutritional treatment of persistent diarrhea➤ Zinc supplementation
Preventive	<ul style="list-style-type: none">➤ Protected safe water➤ Hand-washing sanitary disposal of fecal waste➤ Vaccines➤ Improved nutrition, vitamin A and Zinc

Despite the reported reduction in the number of deaths, the estimated global diarrheal incidence rates have not changed significantly since 1980 [Keusch 2016; Fischer Walker 2013]. Children in Sub Saharan Africa and South Asia experience an average of 2.7 episodes of diarrhea per year, lasting an average of 4.3 days. More than 50% of severe diarrhea episodes occur in the above mentioned regions [Keusch 2016; Fischer Walker 2013].

More than 26 bacterial, viral, and parasitic etiologies cause diarrheal disease but only a few accounts for a major portion of the burden. In a large multicenter case-control study, rotavirus, Cryptosporidium, Enterotoxigenic *Escherichia coli* (ETEC) and *Shigella* species have been identified as the major causative pathogens for diarrheal episodes in children below age five [Kotloff 2013]. Rotavirus was the dominant causative pathogen in those 0-23 months old while *Shigella* dominated in 24-59 months children [Kotloff 2013]. The study showed also that 72% of controls without diarrhea harbored one or more putative pathogens and 31% had two or more, reflecting the fecally contaminated environment in which they live [Pop 2014, Kotloff 2013]. Similar results have been reported from a double-blind randomized controlled trial that evaluated the role of probiotic in preventing acute diarrhea in children [Sur 2011]. In Kolkata-India, rotavirus was not anymore the dominant pathogen in children above 5 years of age [Nair 2010]. In this age group, *Vibrio cholerae* has been identified as the major etiologic agent among hospitalized patients.

Cholera represents an important public health problem and large cholera outbreaks occur in many settings. In addition to 87,000 cases and 2,500 deaths registered in cholera epidemics, 2.8 million cholera cases and 91,500 cholera deaths occur in 61 cholera endemic countries. Under-reporting is significant from highly endemic countries. Approximately half of the deaths occur in Africa, but India, Nigeria, China, Ethiopia, and Bangladesh are at highest risk [Ali 2015]. Potential factors which will worsen the situation in the coming years are climate change, urbanization, increase in population density, (further) rise of social inequalities.

Country situation update

Participating countries provided an update on cholera epidemiology, progress in the prevention and control of cholera and a mapping of country capacities. Table 2 provides a summary of the overall data. More details for each country are reported in the following paragraphs.

1. *Bangladesh*

Epidemiology update: Bangladesh is considered as an endemic country for cholera. According to the 2008 United Nations data, the entire population of Bangladesh is at risk of cholera. The incidence is estimated to be 2.6/1000 population/year. Case fatality rate (CRF) without treatment ranges from 25% to 50%, and decreases to 1% in presence of treatment.

A hospital based surveillance network covering 2% of the overall hospital admissions is currently run by the International Centre for Diarrheal Disease Research (icddr,b). Of the 120,000 diarrheal patients admitted to the hospitals covered by the network, 22,000 suffer from cholera. The real numbers could be 450,000 hospitalized cholera cases and 4500 deaths per year across the country. A big challenge is to strengthen countrywide surveillance to identify high risk areas for cholera.

Progress in the prevention and control: Oral cholera vaccine (OCV) is not mandatory in Bangladesh. However, from 2011 onwards, several vaccine studies have been conducted to evaluate the feasibility and effectiveness of a mass cholera vaccination [Qadri 2015]. Over 900,000 doses of OCV have been used in both urban and rural settings. Protective efficacy of a single dose has also been evaluated [Azman 2016].

From 2017 onwards, OCV will be included in the project management implementation plan and operational plan (2017-2021). OCV has been included for priority population in operational procedure of communicable disease control and will be executed after approval from the Executive Committee of the National Economic Council (ECNEC).

An advocacy meeting including public and private stakeholders was held in January 2017. All opined to include OCV as a part of integrated strategy for control and prevention of cholera in high risk population.

Country capacities: Thanks to two OCV technology transfer (International Vaccine Institute and Welcome Trust Hilleman laboratories) to Bangladesh (Incepta Vaccine Ltd), the country produces OCV. Cholvax is one locally produced OCV similar to Shancol. A single strain inactivated OCV, Hillchol, is currently in phase I/II dose-escalation to evaluate the most safe and immunogenic formulation of this new vaccine which is expected to be cheaper than Shancol.

Main challenges: Licensure and funding for locally produced vaccine (Cholvax) deployment, with WHO pre-qualification is one of the main challenges for cholera prevention and control. Another challenge concerns the coverage area of the existing surveillance system which needs to be extended.

2. Cambodia

Epidemiology update: Cholera is widespread in Cambodia and has multiple modes of transmission. Sporadic cases occur while outbreaks are associated with social gathering (wedding, funeral), in institutions (prisons) or in households with poor personal hygiene or no latrines. From November 2009 to June 2010, cholera cases have been reported in 20 provinces. The epidemic was marked by an increasing number of cases over time with a peak observed in May-June 2010. Analysis by age showed that children aged 5 to 15 years old represent the high-risk group. CFR was less than 1% but could be higher in remote and hard to reach villages.

Progress in the prevention and control: Outbreaks are investigated and controlled as rapidly as possible by means of communications (TV and radio spots, posters, flyers), community mobilization in collaboration with Ministry of Rural Development and NGOs, treatment supply and improved logistics.

Country capacities: Two Surveillance networks, CAM EWRAN and sentinel surveillance, are in charge of monitoring infectious diseases including watery diarrheal disease and reporting of laboratory confirmed cholera cases to Centre for Disease Control .

Main challenges: The main challenge is to reduce the rate of under-reporting from surveillance systems.

3. India

Epidemiology update: Overall, 23 states and Union territories report cholera. The disease is endemic in 13 out of the 23. Several states do not report any cholera cases but this is potentially due to the limited surveillance system. A disease burden study has estimated an annual number of 675,188 cholera cases and 20, 356 deaths [Ali 2015] with an increasing number of outbreaks over time. Indeed, from 2014-2016, a total of 197 cholera outbreaks were reported while only 68 outbreaks including 222,000 cases and 823 deaths were identified from 1997-2006 [Kanungo 2010]. The largest

number of case and deaths were recorded in June-July. Global positioning and Google Earth used in investigation of cholera outbreaks showed that borders of water are the main sources of outbreaks [Masthi 2015]. Most of the *V. cholerae* strains showed extended antimicrobial resistance to a number of antibiotics [Chowdhury 2016]. West Bengal, Odisha, Assam and Pinjab are the most affected areas. Odisha state is one of the most affected regions in India even if significant drop in both incidence and mortality have been reported from 2007 to 2016.

Progress in the prevention and control: OCV is not part of the National Expanded Program on Immunization (EPI). However, a mass vaccination campaign was carried out in 2011 in Odisha state. Overall, 31, 552 received the first dose (coverage rate: 61.3%) and 23,751 received the second dose (coverage rate: 46.2%). Public health vaccine delivery cost was \$0.49 per dose or \$1.13 per fully vaccinated subjects.

Other progress in the prevention and control of cholera include: 1) guideline and standard operational procedures (SOP) shared with districts; 2) prepositioning of anti-diarrheal drugs, oral rehydration solutions (ORS), Halogen tablets, bleaching powder; 3) early case detection and referral mechanism of severe diarrhea cases; 4) case-based surveillance; 5) assignation of Key informants at village level for early information; 6) sensitization/Coordination between departments for preventive measures; 7) disinfection of drinking water sources and routine water quality monitoring. Preparedness for cholera control is also insured by IEC campaigns (May-Oct), ORS Corner and door-to-door visit in villages for free distribution of ORS and Zinc (Dr. Kar, India)

Furthermore, to increase awareness and community mobilization a number of actions (e.g. door-to-door visits, placards, slogans, banners, special annual campaign on Malaria Dengue Diarrhea) are regularly conducted.

The country-level surveillance network is limited. However, there is a weekly surveillance system at community and health facility level. Laboratory surveillance of ADD is continuous in all districts and all suspected outbreaks of ADD are investigated for cholera.

Country capacities: This includes community and health preparedness for impending acute diarrheal diseases and cholera, the capacity of the health system to implement disaster risk management programs, the functional capacity of health facilities, meteorological agencies, agencies for disposal and management of waste, community knowledge, attitude and practice of preventive and healthy life style and quality surveillance and identification of early warning signals.

Main challenges:

Health is not a priority in poverty-ridden communities, marginalized, rural and tribal populations. Poor availability of safe drinking water supply, inadequate ownership of programs, poor local health infrastructure, inadequate priority setting mechanisms and long incubation periods for research programs were cited as the main challenges for a better control and prevention of cholera in India.

To improve the situation several solutions have been proposed:

- Early actions to react fast / potentially manage outbreaks
- Need for improved hygiene practices
- Capacity for risk prediction
- Convincing government on the need for vaccination at least in high-risk areas as WASH is not enough given the nutritional status of the population

Decision makers acknowledge that cholera is grossly underreported and steps are being taken to spruce up the surveillance capacity and reporting by the states. Also decision on strategy for immunization is contingent on disease burden data in less than one year old as well as immune-bridging studies with OCV in less than one year olds.

4. Indonesia

Epidemiology update: Indonesia is a low endemic country for cholera. Overall, 10 cholera outbreaks occurred in this country but no cases of cholera have been reported in Indonesia since 2011. However, cholera case data are probably under-reported since the prevalence of watery diarrhea is still high. In 2013, the incidence of diarrheal diseases for all age population was 350/1000 population and 670/ 1000 in children less than 5 years old. More than 50,000 cases of diarrhea have been reported in 2016.

The main risk factors for diarrheal diseases in Indonesia are hygiene, sanitation and water supply. Indeed, only 38.7% of the population practice healthy and hygienic behavior, 9.4% (2.5 millions) practices open defecation, 10.9% uses unsafe water, and 7.3% drinks contaminated water.

Progress in the prevention and control: Significant reduction in the number of cholera cases observed in Indonesia since 2008 is mainly explained by breast feeding and improved hand hygiene practices.

Main challenges: Setting of active surveillance by rapid diagnostic test was reported as the main challenge for a better prevention and control of cholera in this country.

5. Malaysia

Epidemiology update: With the exception of Sabah region, cholera is no longer endemic in Malaysia. The incidence of cholera remain <1 per 100,000 population and CFR was around 2% in 2001 and reduced to <1% in 2016. The majority of cholera cases occur in Sabah region which is a coastal area bordering with Thailand. People in this area are mostly foreigners and have poor access to clean water and sanitation. The ratio of Malaysian/foreigners cholera infection in this region is 80/20. Scarce safe water supply, unresolved environmental issues (excreta, solid waste), poor hygiene and food sanitation, cross border crossing, illegal coastal and urban settlements, poverty, and illiteracy and language barriers are among factors that contribute to the observed high incidence rate of cholera among foreigners in this region.

Progress in the prevention and control: A multifaceted approach has been setup to improve prevention and control. This includes:

- 1) Infrastructure (water supply, improved sanitation, accessibility to affordable healthcare and education), social, governance and technical issues has been set-up
- 2) Governance: political commitment, financial investments for improved sanitation, case notification, food sanitation, free treatments and quarantine leave for working parents,
- 3) Technical: gap analysis, capacity building, strengthened surveillance systems and national guidelines
- 4) Social: extensive promotion on cleanliness, personal hygiene and safe food preparation, breastfeeding campaigns, community empowerment by fighting poverty and illiteracy and by restructuring settlements with affordable homes.

OCV is not yet in National Immunization Programs (NIP) but is available in the private health facilities. Oral prophylaxis is also available for close contacts of cholera cases and food handlers.

Country capacities: Since 2012, huge investments have been provided by the MoH to improve hygiene provision for rural areas. The coverage of clean water is now >90%. Cholera is a notifiable disease. The country has several surveillance systems including the web based eNotis surveillance system, acute gastroenteritis (AGE) surveillance as proxy to food and water borne diseases (FWBD) outbreak indicators, laboratory and rumor surveillance.

Hospitals and private labs have the capacity and technics to diagnose cholera. The availability of mobile clinics improves accessibility to affordable services.

The country has cholera guidelines for crisis preparedness and response, outbreaks, management and treatment. There are also simulation exercises, capability and capacity building including Epidemic Intelligence Program (EIP).

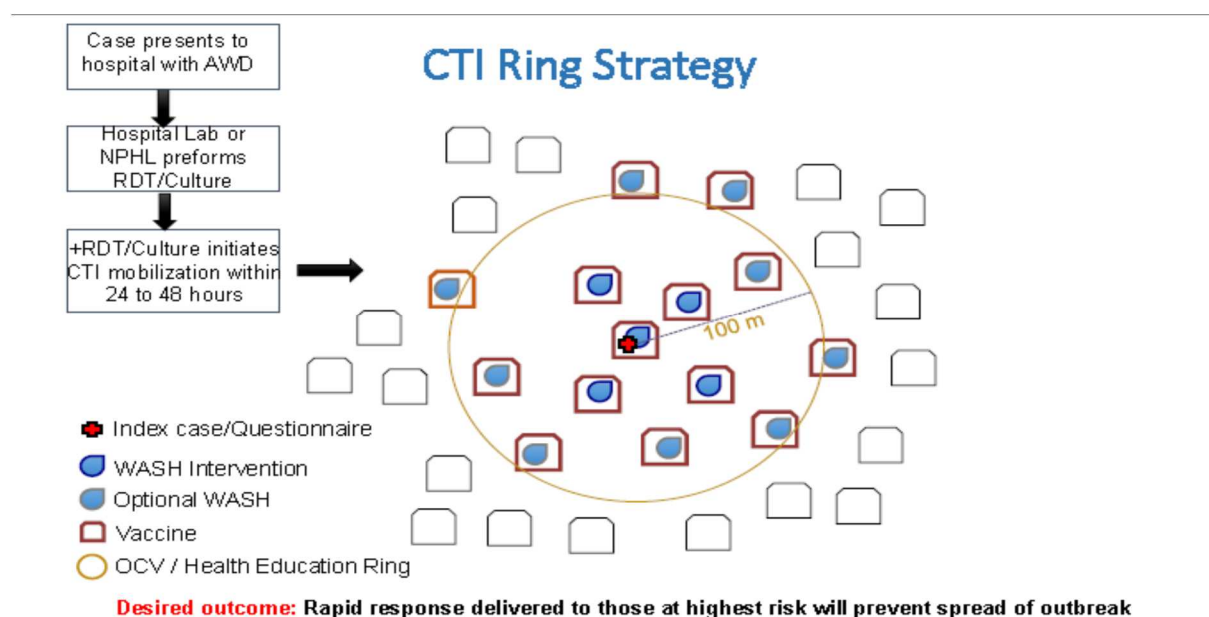
Main challenges: Cross border crossing, Illegal coastal and urban poor settlements, poverty, illiteracy and language barrier have been cited as the main challenges in the fight against cholera.

6. Nepal

Epidemiology update: Cholera is endemic in Nepal. Outbreaks occur frequently in different parts of the country with different morbidity and mortality rates. The highest incidence rates are observed in young adults (20-24 years old). In 2016, 169 laboratory-confirmed cholera cases were identified but no death was reported. The epidemic peak started in early June and ended in early October. In Kathmandu Valley, cholera cases are reported almost every year especially during the rainy season. In 2016, 10% of the 2376 acute watery diarrhea (AWD) cases identified in this region have been clinically diagnosed as suspected cholera.

Progress in the prevention and control: In 2016, the epidemiology and disease control division (EDCD) of the MoH implemented the Comprehensive Targeted Interventions (CTI) to control cholera in Kathmandu Valley. CTI follows a ring strategy (Figure 1) and includes enhanced surveillance, laboratory diagnosis, field investigation, WASH and OCV vaccination. More than 700 volunteers were mobilized to provide health education messaging through different channels (door-to-door awareness campaigns, community level intervention), to distribute Chlorine solution (Piyush) for water disinfection, to test water quality, and to perform surveys during outbreak season and as a part of response.

Figure 1: CTI ring strategy in Kathmandu Valley



District public health offices (DPHO) implement the decisions taken by the MoH and coordinate with local governmental and non-governmental stakeholders working in health and WASH. A Steering Committee for Enteric Disease Control and a Task Force for Cholera Control were formed in 2015. Several meetings of the steering committee were conducted to guide and make decisions for the prevention and control of enteric diseases.

Different types of OCV vaccination campaigns were carried out across the country. This included a reactive OCV Vaccination in Rautahat district in 2014, a preventive OCV vaccination campaign in Nuwakot and Dhading in 2015 (95% coverage) and another one in high risk area of Banke district in 2016 (84% coverage). All vaccination campaigns were effectively implemented and proved that pre-emptive vaccination can be effectively organized within the public health system in Nepal and that the collaborative partnership is the key to success.

Country capacities: Cholera is an early warning reporting system (EWARS) reportable disease. All clinical cases of cholera are reported monthly from health facilities through the health management information system. A multiyear plan (2017-22) is drafted that covers the surveillance system, laboratory diagnosis, coordination, WASH logistics and supply, immunization and monitoring and evaluation. The epidemiology and disease control division (EDCD) setup sentinel sites for active surveillance and linked with national public health laboratory (NPHL) and selected hospitals to initiate and monitor the surveillance process. EDCD lead cholera and diarrheal outbreaks investigations review and publish daily/weekly situation of cholera and AGE. NPHL receive and test stool and water samples and provides results to EDCD. They also receive information on supply needs for the selected hospitals. The Cholera surveillance is now embedded in the existing AMR sentinel surveillance system using 18 sentinel sites, but they are not all functional.

Main challenges: Cholera Prevention and Response National Road Map should be endorsed urgently. WASH status is still suboptimal in most of the districts and urban areas. Basic Water Supply coverage is only 83.59% and sanitation is available for 87.17% of the population. Multiple sources of water (Tankers, Dug-wells, Stone spouts, Tubewells) are in use and water quality monitoring is not performed for all sources. Existing surveillance of cholera is inadequate to cover all of the urban and rural districts in the country due to limited laboratory facilities. There is a need to identify risk groups and target mass vaccination by strengthening surveillance systems. Advocacy is also needed to introduce the OCV vaccination.

7. Pakistan

Epidemiology update: Cholera is endemic in Pakistan. Overall, 4-6 episodes of diarrhea per child per year are reported in those less than five years, but cholera cases are not specified. The annual under-five mortality due to diarrhea represents 13.2% of all cause-mortality in this age group.

Overall, 20,880 suspected cases and 343 deaths were recorded in 2010-2014. The highest number of cases and CFR were reported in Sindh region. The annual incidence rate and CFR in 2011 were 1.64/1000 and 3.63-41.56 respectively. Infants and children 1-4 years old had the highest incidence rates (7.16 and 7.01/1000 respectively).

Investigation of environmental factors such as water contamination with *Vibrio cholerae* showed the presence of seasonal variations with the highest contamination rates recorded from July to September.

Country capacities: There is a passive case-based surveillance from large hospitals of major cities, and WHO-EMRO documents and reports of NGOs working in disaster situations. Available data come from published articles, and from health facilities, but data are very patchy.

Main challenges: Poor water and sanitation situation is a major challenge. In 2014-15, 16M people did not have access to clean drinking water. Overall, 13% of the population does not have toilet facility. Weak surveillance system and underreporting together with limited laboratory capacities are among other challenges to prevent and control cholera in Pakistan. The lack of surveillance system leads to significant underreporting. Recurrent humanitarian emergencies constitute another challenge in the prevention and control of cholera in Pakistan.

8. Philippines

Epidemiology update: The largest outbreak during the last 10 years occurred in 2008 with 216 laboratory-confirmed cases. The number of laboratory-confirmed cases declined afterwards until 2016 when there were 6 laboratory-confirmed cholera outbreaks events captured by the Event-based surveillance system. These outbreaks caused 124 cholera cases but no death occurred. The number of confirmed cholera cases was 588.9% higher compared to the same time period in 2015 (18 cases). Median age of confirmed cases was 14 years old with the highest number observed among 5-10 years old (19%) and 1-4 years old (18%). Both male and female were equally affected. Different actions including case management and referral, case notification and report and implementation of control measures have been undertaken at local, regional and national levels to halt the outbreaks.

Progress in the prevention and control: The department of health (DOH) recognized the role of water sanitation for a better health and interruption of the spread of the disease. In 2015, almost 90% of houses had safe water. DOH also provides capacity building for “zero open defecation program (ZOPD)”. ZOPD includes demand creation, good governance and sanitation marketing.

Country capacities: Cholera is a notifiable disease that should be reported within 24 hours. The country has 2 surveillance systems: Event-based surveillance and indicator-based surveillance, performed at local, regional and national level.

The DOH has also implemented the Neglected Tropical Disease (NTD) initiative and the Environmental Health Program. NTD initiative comprises food and water-borne programs and an integrated approach including education and training. The Environmental Health Program will direct the provision of WASH, regional sanitary engineers and local sanitary inspectors.

Main challenges: Capacities in diagnosis and treatment are not uniform across the country. OCV vaccination is limited to endemic areas.

9. Thailand

Epidemiology update: The incidence of cholera has significantly decreased during the last decade but outbreaks occur occasionally. Migrant population plays an important role in cholera transmission. In 2015, 125 cases of cholera have been reported, the highest rates being in teenagers and young adults (15-34 years). The number of cases in 2016 dropped to 51. Only 15-20 provinces, mainly located in the south were affected. The main causes of major outbreaks in 2007-2016 were i) seafood contamination; ii) coastal province epidemics, iii) and migrant workers.

Progress in the prevention and control: Hospital-based surveillance system is in charge of early detection of suspected cholera cases and laboratory confirmation. Prompt investigation and control are insured by trained Surveillance and rapid response teams (SRRTs). There has been considerable improvement in sanitation and safe water supply by constructing toilettes at all houses, sewage management and by increasing supply of chlorinated tap water or bottle water.

Country capacities: Overall, 12 regional laboratory centers of department of medical sciences are available for the collection and laboratory investigation of both food and water samples. Furthermore, 1030 SSRTs nationwide work on surveillance and quick response to an outbreak.

Main challenges: This include continuing improvement of sanitation and safe water supply, limited vaccination and varying capacity in diagnosis and treatment.

10. Vietnam

Epidemiology update: Since 2000, most cholera outbreaks occurred in the Northern part of the country, with Hanoi at the starting point. The cases in the first weeks of epidemics were scattered but concentrated in specific time in some districts and wards. In the first 2 weeks of outbreak, there was no epidemiological linkage between cases. The highest numbers of cholera cases were reported among 15-29 years old. Both genders were equally affected. Analysis by professional activity showed the highest incidence rates among farmers (39%), followed by pupil, students (14%) and free labors (13%). No more cases of cholera were reported since 2012.

Progress in the prevention and control: Two laws on infectious disease control and prevention and food safety were approved in 2007 and 2010 respectively. A global health project has also been set up to i) enhance the capacity of the health system in the surveillance, early detection, coordination and response to diseases and outbreaks, ii) to provide assistance in the establishment of an emergency operation center in Vietnam, iii) to enhance the capacity of public health laboratory system to meet core capacities in the implementation of IHR and iv) to enhance application of information technology in disease surveillance and the capacity to respond to public health events. Thanks to the national program on clean water supply and sanitation in rural areas (2015), 86% of people have benefited clean water and 65% of households had toilettes with hygienic conditions.

Country capacities: There is an active surveillance system for the early detection of *V. cholerae* in environment and foods. Laboratory testing (rapid testing, culture, serotyping), antibiotic resistance tests and molecular testing are performed at national and regional levels. National guideline on cholera control and prevention is also available to guide on cholera diagnosis and treatment, outbreaks confirmation, establishment of the committee of cholera prevention and control and on how to respond to outbreaks.

mORCVAX, a killed whole cell vaccine, is manufactured by VABIOTECH in Vietnam with a capacity of 10 million doses per year. Vietnam National regulatory authority has been is qualified by the WHO

and vaccination was deployed in 16 provinces with high incidence and for high risk areas and populations.

Main challenges: Maintaining and improving the clean water supply and environment sanitation program. Strengthen collaboration among neighboring countries on sharing information and cholera control.

Table 2: Summary of country situation update

Thematic/Country	Bangladesh	Cambodia	India	Indonesia
Epidemiology	Endemic, and seasonal outbreaks CFR 25 to 50% without treatment and 1% with treatment	Not cholera endemic, sporadic cases in 18 provinces. CFR <1% but higher in hard to reach villages	Endemic with an estimated 834,00 cholera cases and 25,000 deaths every year Several states do not report any cholera cases potentially due to limited surveillance system	Low endemic. no outbreaks since 2011 Incidence of diarrheal diseases for all age population is 350/1000 population and 670/1000 children < 5 years old
WASH	Lack of water pipe	Data not available	Open defecation with limited availability of safe drinking water supply mainly in rural area Sharing sanitation facilities with other households	Practice of healthy and hygiene behavior by only 38.7% Open defecation practiced by 9.4% population (2.5 millions), 10.9% use unsafe water, 7.3% drinks uncooked water
OCV vaccination	OCV included in national plan for at risk groups. Technology transfer for vaccine development in country Locally produced Vaccine (Cholvax) will be implemented	None	Vaccine introduction study done in Odisha state OCV vaccine is not part of the EPI program	None
Surveillance/diagnostic	Hospital based surveillance at 2% Nationwide surveillance on-going at 21 sites	Event based surveillance, laboratory confirmed (CamEWARN) Surveillance of Acute Watery Diarrhea through CAM EWARN Reporting of laboratory confirmed cholera cases to CDC Dept Outbreak investigations	weekly surveillance system in all regions Guidelines and SOP for early case detection Global positioning system & Google Earth in the investigation cholera outbreak. Continuous laboratory surveillance of ADD in all districts Visit of collector to affected sites for monitoring quick action	
Advocacy	Advocacy meeting: January 2017	Communications (TV and radio spots, posters, flyers) Community mobilization	Sensitization of PRI members, local PHC staff, ASHA, AWW and community Other modes of community mobilization: - Miking - Interpersonal Communication by door-to-door visit - All stake holder involvements in meetings	
Challenges	Licensure and funding for locally produced vaccine (Cholvax) deployment, with WHO pre-qualification Inadequate coverage of the surveillance system	Under-reporting of surveillance systems	Marginalized rural and tribal populations Poor availability of safe drinking water supply Inadequate ownership of programs Poor local health infrastructure Inadequate priority setting mechanisms Long incubation periods for research programs Introduction of OCV	Under-reporting Lack of RDT

Table 2: Continued

Thematic/Country	Malaysia	Nepal	Pakistan
Epidemiology	Not Endemic except in Sabah region Incidence rate <1 per 100,000 populations and CFR <1% in recent years Malaysian: Foreigners incidence rate = 80:20. Cycle pick every 3 years	Endemic, frequent outbreaks mainly during rainy season 5042 ADD cases and 169 laboratory confirmed Cholera cases reported mainly from Kathmandu valley (150/169). No deaths occurred.	Endemic 4-6 episodes of diarrhea per child per year < 5 year Under five deaths per year from Diarrhea: 13.2%
WASH	Scarce safe water supply in some areas Unresolved environmental issues – excreta, solid waste Poor hygiene & food sanitation with cross border crossing and illegal coastal and urban settlements	Suboptimal WASH status Basic Water Supply coverage: 83.59% , Sanitation: 87.17%. Hand-washing: 72.5%	16M do not have access to clean drinking water 27% consume tap water, 86% have access to improved water source, 73% have access to sanitation facilities 13% no toilet facility
OCV vaccination	Vaccine and antimicrobial prophylaxis OCV not in EPI but available in the private health facilities Oral prophylaxis for close contacts and food handlers	Reactive OCV Vaccination in Rautahat district in 2014. Preventive OCV vaccination campaign in Nuwakot and Dhading in 2015 and in Banke district in 2016	OCV not registered
Surveillance/diagnostic	Mandatory web based within 24 hour notification National guidelines and laboratory diagnostic capacity in all laboratories Regulatory Infrastructure	Cholera is a EWARS reportable disease. Clinical cases reported monthly from health facilities through existing HMIS system. Cholera Surveillance embedded in the existing AMR sentinel surveillance system using 18 sites. Comprehensive Targeted Interventions (CTI) to Control Cholera in Kathmandu Valley in Kathmandu valley in 2016	Facility based surveillance system in place in the province of Punjab since 2011(which has 60% of the population of Pakistan limited laboratory capacity Passive case- based surveillance from large hospitals of major cities, and WHO EMRO Documents and reports of NGOs working in disaster situations
Advocacy	Political commitment, interagency collaboration and coordination Legal approach for child education, case notification and management, food sanitation Subsidy for the poor (rural and urban) Ensure accessibility to affordable healthcare and education Free treatment and quarantine leave for working parents Restructure settlements with affordable homes Hygiene Promotion, community engagement, Social Mobilization campaign adapted to local culture	Door to Door Awareness Campaign. Community Level Intervention: Booth Campaigns – Strategic Locations -Awareness rallies -Miking (In mobile vehicle and also during rallies) -Awareness sessions to community groups and key community actors -Food and food outlet inspection- Food authority and Municipality -Mass communication by various media and special programs -Schools reached to educate and use children on Cholera and prevention	
Challenges	Cross border crossing Illegal coastal and urban poor settlements Poverty, illiteracy and language barrier Inadequate financial investment for WASH	Identify risk groups and target mass vaccination by strengthening surveillance. Need to give high priority to improve WASH status. Enhance collaboration and coordination. Advocacy needed to introduce the OCV vaccination Endorse Cholera Prevention and Response National Road Map	Recurrent humanitarian emergencies Weak surveillance system and underreporting Limited laboratory capacity Under resources of the public health control activities Poor water and sanitation condition in conflict affected countries Lack of cross border collaboration between the neighboring countries

Table 2: Continued

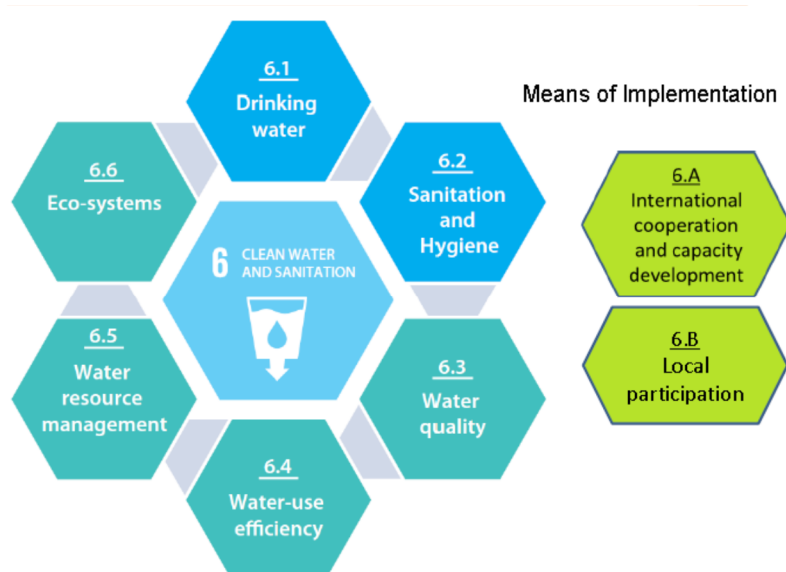
Thematic/Country	Philippines	Thailand	Vietnam
Epidemiology	14,592 diarrheal and 96 deaths cases in 2016 124 (0.85%) were laboratory confirmed cholera No deaths.	Incidence significantly decreased in the past decades while outbreaks occasionally occurred: 4 outbreaks since 2017 125 cases in 2015 Main transmitters :Employees of the seafood industry, Migrant population No cholera outbreaks post-flood disasters in recent years	No Cholera since 2012
WASH	Zero Open Defecation Program. Environmental Health Program: WASH, Regional Sanitary Engineers, Local Sanitary Inspectors	100% toilets at all houses Sewage management Chlorinated tap water and/or bottle water	Health education Clean water supplies and Environment sanitation Food hygiene and safety
OCV vaccination		OCV in a special setting, population in the temporary shelter at Thai-Myanmar Border	Local vaccine production NRA approved by QWHO; Vaccination deployed in 16 provinces with high incidence and for high risk areas and populations
Surveillance/diagnostic	Event-based Surveillance Epidemiology Bureau of the DOH, Program Manager Regional Epidemiology & Surveillance Units Regional Program Coordinators Collection of human (rectal swab, stool) and environmental (water) samples. Laboratory testing of water samples thru the use of Collilert machine. Records review and active case finding Random inspection of water refilling stations Continuous surveillance of diarrhea cases Food & Water-borne Program. Regional Sanitary Engineers Local Sanitary Inspectors	Hospital-based surveillance system – Early detection of suspected cholera cases – Laboratory confirmation • Timely and proper management of patients • Prompt investigation and control by the trained Surveillance and rapid response teams (SRRTs). Improving Sanitation and Chlorination of Water Supply 12 Regional Laboratory Centers of department of Medical Sciences. Water and Food samples with 1% APW	National guidelines for cholera diagnosis, treatment, surveillance, response, control and prevention Testing in dog slaughter houses and restaurants Mobile teams for early detection and investigation of outbreaks Urgent reporting to higher level of health care system Close collaboration between treatment and preventive systems in reporting, specimen collection, and sharing specimen Laboratory testing at national and regional Level At district level: Specimen collection, storage and transportation; Microscope examination, Gram staining, Testing of water, fresh vegetables in restaurants and markets
Advocacy	The Department of Health (DOH) recognized the distinctive link between sanitation and better health, need for a new vision in sanitation, expressed in clearer policy and action programs		Enhance the leadership of political system and of Local Steering Committee on cholera prevention and control Mobilize whole political system in cholera prevention and control. Close collaboration between related sectors on food hygiene and safety, clean water supply and environmental sanitation, education, information, transportation
Challenges		Continuing improvement of sanitation and safe water Limited vaccination. Varying capacity in diagnosis and treatment.	Maintaining and improving the clean water supply and environment sanitation program. Strengthen collaboration among neighboring countries on sharing information and cholera control

Existing interventions on cholera prevention and control in Asia

1. Water, Sanitation and Hygiene

WASH is one of the central components of the UNICEF agenda for the 2030 Sustained Development program. The Sustained Development Goal 6 (SDG6) is a distinct part of WASH that will ensure availability and sustainable management of water and sanitation for all, by achieving access to equitable and affordable water, adequate sanitation and hygiene and end open defecation, by paying special attention to the needs of women, girls and those in vulnerable situation (Figure 2).

Figure 2: Main targets of SDG6

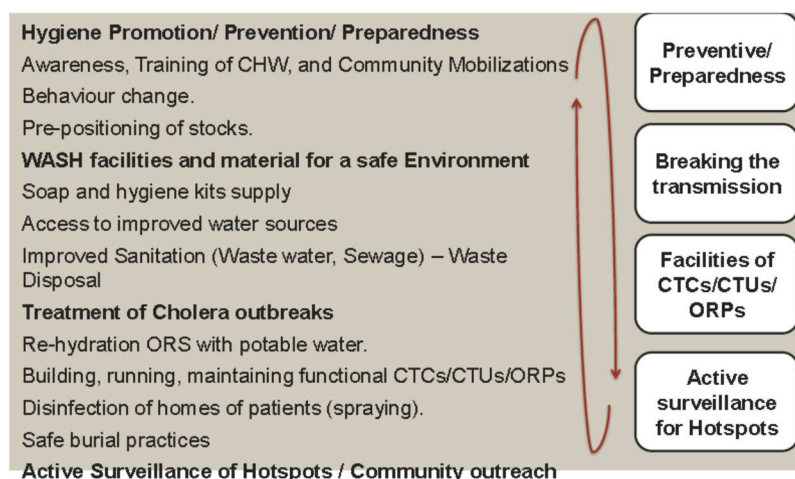


UNICEF chairs the global task force for cholera control (GTFCC) WASH working group and is part of two cholera platforms. So far, the working group developed technical briefs, set-up a study to define households' disinfection, its feasibility and effectiveness (collaboration with Tuft school of engineering) and carried out a literature review (collaboration with London School of hygiene and tropical diseases).

WASH is also the heart of action of Save the Children (StC). StC is an international non-governmental organization that promotes children's rights. The StC global approach to cholera includes emergency health units, prepositioning stocks in 8 countries around the globe, country programs, working with partners, and a multi-sectorial approach. The StC WASH program is a continuous effort that includes various preventive and preparedness activities and active surveillance of hotspots (Table 3). The objectives are to i) keep fecal matters away from drinking water, ii) inactivate cholera in contaminated water of food before consumption and iii) provide WASH facilities for medical teams and patients.

Humanitarian responses are very complex because of security issues, and time-frame of actions. StC was involved in a post-emergency WASH response in Nepal in 2016. The action plan was coordinated by the European Centre for Disease Control (ECDC) and included hygiene promotion, water testing and treatment in affected areas and monitoring of water quality at sources.

Table 3: WASH and cholera: a continuous effort



2. Oral Cholera Vaccine

The global stockpile of OCV was created in 2013 as an additional tool to help control cholera epidemics. Between July 2013 and June 2014, two million doses of vaccine were available from the stockpile. The OCV stockpile managed as rotating fund by International Coordinating Group (ICG) comprised of the International Federation of Red Cross and Red Crescent Societies (IFRC); Médecins Sans Frontières (MSF), United Nations Children's Fund (UNICEF) and the WHO, which also serves as the secretariat. UNICEF hosts the OCV stockpile in its supply division. In 2013, the Gavi Board approved support for the OCV stockpile as part of the Vaccine Investment Strategy with a contribution of US\$ 110 million for the period 2014-2018. The first Gavi-supported campaign using the global stockpile began in August 2015 in Cameroon. The dynamic creation by the establishment of stockpile has played a role in increased use of OCV. Indeed, from 2013 to 2016, OCV stockpile was used for vaccination campaigns in endemic situation, humanitarian crisis and outbreaks (Table 4). The largest campaigns occurred in South Sudan and Zambia. The overall coverage rates for all campaigns were respectively 94.2% for one dose and 76.6% for two doses. The cost per dose administrated and per fully immunized person were respectively US\$2.85 and US\$5.70. The main reasons for non-vaccination were absenteeism, conflict with work during the vaccination hours and lack of information on vaccination campaigns.

In order to investigate whether a single dose strategy could be used as an outbreak response, two campaigns were conducted in South Sudan (2015) and in Zambia (2016). The results showed that vaccinating twice the number of people with a single dose can prevent more cases and deaths during an outbreak by rapid herd protection compared to vaccinating less people with the standard 2-doses strategy. Other novel strategies including self-administration of the second dose (fisherman living in floating homes), out of cold chain use during distribution (Guinea 2012) and OCV delivery combined with other interventions (Refugee camps, Cameroon 2015) have also been tested and provide evidence of the feasibility of conducting OCV campaigns in a variety of scenarios.

Table 4: The use of OCV stockpile in 2013-2016

Year	Type of Campaign	Number	Countries
2013	Endemic	2	Haiti (2)
2014	Endemic	10	DRC, Guinea, Haiti (8)
	Humanitarian Crisis	7	South Sudan (6), Ethiopia
2015	Outbreak	4	Malawi, South Sudan (Juba and Torit), Iraq, Nepal
	Humanitarian crisis	6	South Sudan (3), Tanzania, Cameroon, Malawi
2016	Endemic	1	Haiti
	Humanitarian crisis	3	Niger, South Sudan (2)
	Outbreak	2	Malawi, Zambia
July 2013 - July 2016		35	

Delivering Oral Vaccine Effectively (DOVE) cholera project, the DOVE project, (<https://www.stopcholera.org>), funded by Bill and Melinda Gates foundation, works in close collaboration with the WHO, UNICEF, and other key partners in order to ensure that populations at risk of cholera will benefit from OCV in an appropriate and effective manner. The DOVE project promotes appropriate and effective use of OCV through research, monitoring and evaluation, technical assistance, and the development of practical resources to inform the use of OCV in 8 countries (Cameroon, India, Malawi, Nepal, South Sudan, Uganda, Vietnam and Zambia).

The international Vaccine Institute (IVI) is an international vaccine R&D center with field programs in 29 countries in Asia, Africa and Latin America. The main mission of IVI is to discover, develop and deliver safe, effective and affordable vaccines for global public health in order for developing countries to become free of suffering from infectious diseases.

To help developing country vaccine manufactures (DCVM), IVI engaged in a technology transfer development strategy (Table 5).

Table 5: IVI technology transfer

Company		Partnership	Stage of development
Vabiotech (Vietnam)	mORCVAX	IVI re-formulated, redeveloped process to meet WHO standards.	Licensed in Vietnam (mORCVAX™)
Shantha (India)	Shanchol	Technology transfer May 2008	Licensed in India (Feb 2009). WHO prequalified Sep 2011.
Eubiotics (Korea)	Euvichol	Technology transfer 2010-11	Korean export license 2014 WHO prequalified Dec 2015
Incepta (Bangladesh)	Cholvax	Technology transfer May 2014	IVI conducting clinical trials in Bangladesh, license in Bangladesh expected 2017/18.

To assess the protection of a two-dose regimen of the reformulated killed OCV against episodes of cholera severe enough to require medical treatment, a phase III study has been conducted in Kolkata (India). The results provided evidence of safety of Shanchol and a sustained level of protection was seen in 65% of the vaccinees [Bhattacharya 2013] (Table 6).

Table 6: Protective efficacy of Shanchol during 3 years of follow-up in per-protocol analysis, by year of follow-up

	Year of Follow-up					
	First Year		Second Year		Third year	
	Vaccine <i>n</i> =31,932	Placebo <i>n</i> =34,968	Vaccine <i>N</i> =30,532	Placebo <i>N</i> =33,466	Vaccine <i>n</i> =28,976	Placebo <i>n</i> =31,677
Cholera Episodes	11	23	9	45	18	60
Incidence (per 100,000 person-days)	.10	.19	.08	.38	.17	.53
Protective Efficacy (95% CI lower boundary)						
Adjusted analysis	41% (-13%)		76%** (52%)		65%** (44%)	

p*<.05; *p*<.01

Euvichol present the advantage of having easier administration, lower cost for production and delivery. The safety and immunogenicity of Euvichol was assessed in a phase I clinical trial in Philippines and found to be comparable to those elicited by Shanchol [Baik 2015].

CholVax is currently under evaluation in a non-inferiority trial to Shancol (icddr,b) and an individually randomized placebo-controlled trial to evaluate the use of a single dose in an endemic setting.

To demonstrate feasibility and cost-effectiveness of OCV in different settings, IVI conducted several vaccination campaigns in Nepal, Malawi and Ethiopia. Besides, a pre-emptive campaign in rural “hot spot” in Nepal is ongoing.

3. Patient care

Behavior changes with a preventive approach could help to increase compliance to hand-washing. In a nudge-based intervention study carried out in two primary schools in rural Bangladesh, hand-washing with soap increased from 4% at baseline to 68% the day after nudges were completed and 74% at 2 and 6 weeks post intervention [Dreibelbis 2016]. This study provides evidence that low-cost nudges can lead to important behavior change and improve hand-washing among school-aged children. A randomized controlled trial is ongoing in Myanmar to promote hand-washing in children by placing hidden surprises at washing points.

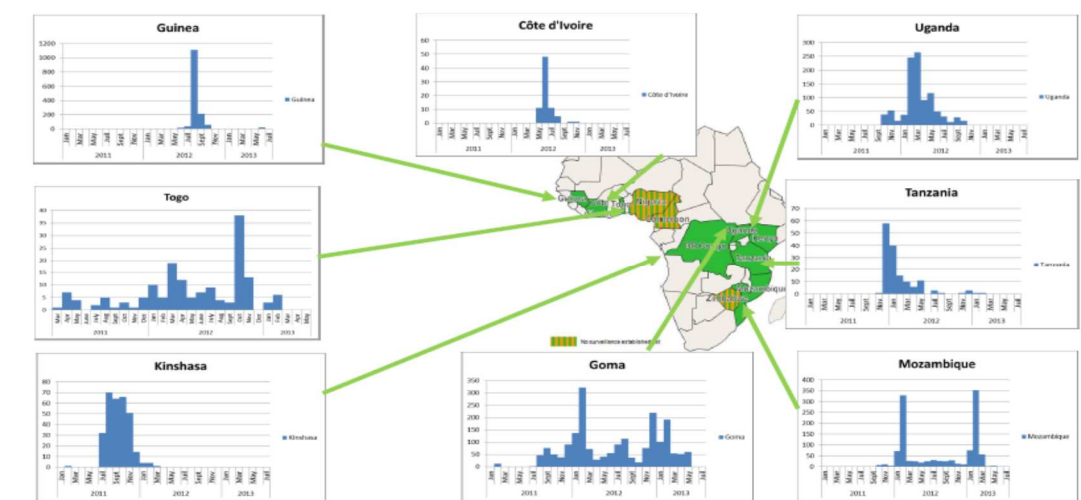
4. Surveillance and research

The African Cholera Surveillance Network (Africhol) was established by Agence de Médecine Préventive (AMP) in 2009 with funding from the Bill & Melinda Gates Foundation. The objective is to determine the incidence of cholera in sub-Saharan African through the creation of a surveillance network in at least eight countries. The main activities of Africhol comprise mapping cholera burden, monitoring and evaluation of OCV campaigns (vaccine coverage surveys, monitoring of adverse effects, economic analysis, anthropological assessment such as vaccine acceptability), impact studies and evaluation of campaigns in terms of logistics, supplies, etc. Comparison of epidemiological patterns across countries showed huge differences both in term of endemicity (Figure 3) and age distribution of cholera cases.

According to Africhol network, overall 4% of the African continent is at risk of cholera, but there is an obvious clustering. As an example, in Goma (Republic Democratic of Congo) 80% of cases are concentrated in only two neighborhoods. As a consequence, mapping and plotting the high risk areas would increase the efficiency of cholera prevention and control campaigns. Preventive OCV campaigns should target these high incidence endemic areas and the entire population to reduce circulation of the virus. Understanding of risk groups and their behavior and living conditions through various methods is also important to reach target groups. Therefore, organization of OCV campaigns according to the daily life of specific population (e.g. fisherman), establishment of innovative OCV

delivery (e.g. self-administrated second dose for fisherman living in floating house, community-led self-administrated second dose) could further enhance cholera prevention and control.

Figure 3: Epidemiological patterns of cholera across eight countries



5. Global interventions

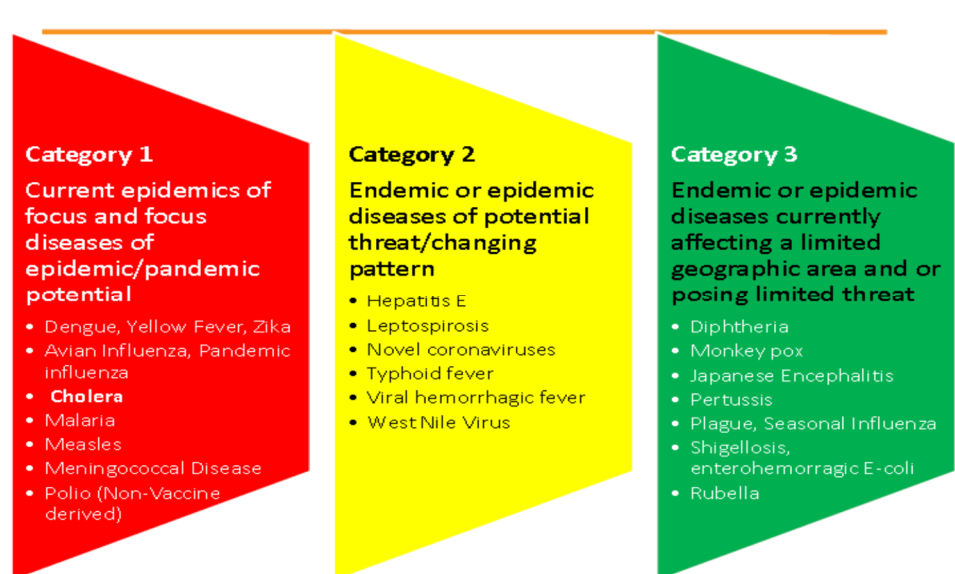
The global task force for cholera control (GTFCC) is a network of technical institutions covering all aspects of cholera control i.e. surveillance and lab, case management, WASH, vaccines, social mobilization and advocacy (Figure 4). The network vision is based on the fact that an integrated approach, collective and multi-sectorial collaboration can stop cholera transmission and end cholera deaths. The renewed strategy aims at ending cholera by 2030. But, reaching this objective faces uphill tasks. Raising the profile of cholera is a real challenge because of equity and human rights issues. For example one case of Ebola would attract more attention if it happened in the USA. Other challenges involve the acceptability of OCV by decision makers and the integration of WASH with OCV because time sequence and partners are different. Vaccine supply versus demand is also challenging as demand increased significantly in parallel to production capacity.

Figure 4: GTFCC objectives

Support global strategies for cholera prevention and control	Provide a forum for technical exchange, coordination, and cooperation on cholera-related activities to strengthen countries' capacity to prevent and control cholera
Support the development of a research agenda with special emphasis on monitoring and evaluating innovative approaches to cholera prevention and control	Increase the visibility of cholera as an important global public health problem

UNICEF has close collaboration with both external (WHO, local governments, implementing partners, communities) and internal (between UNICEF divisions such as supply and health divisions) stakeholders. In the post-Ebola era, UNICEF developed the Health Emergency Preparedness Initiative (HEPI), identified key diseases, categorized them and developed a package of support for each of them (Figure 5).

Figure 5: Disease categorization by UNICEF



The UNICEF cholera kit (https://www.unicef.org/cholera/index_71222.html) is also a key resource that provides practical resources for the implementation of an integrated approach to cholera prevention and control.

A StopCholera toolkit that is a collection of practical resources and how- to guide was created by the DOVE project. This toolkit contains four main modules namely, 1) cholera basic; 2) OCV basics; 3) tools for deciding whether to use OCV and 4) manual for OCV campaigns.

Workshop session



To elicit more consideration for the prevention and control of cholera in participating countries, a breakout session was held. In the first part of the workshop, participants discussed in 4 small working groups, topics related to strengths and weakness/gaps in each country is summarized in Table 7.

The second part of the workshop consisted of brainstorming and cross-fertilizing experiences to answer the following questions:

1. What should countries aim at in terms of cholera prevention and control?
2. What should be the strategic interventions per country to bridge these gaps and reach these objectives?

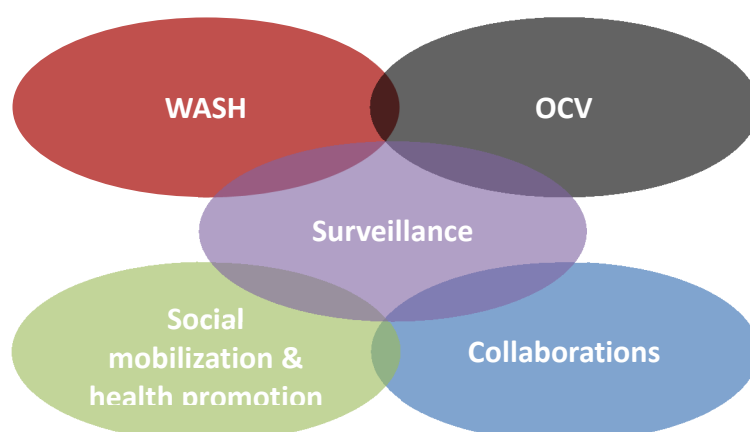
Figure 6 shows the summary of answers provided by participating countries to the first question. There were two clusters of countries in terms of mid-term objectives depending on where they currently stand in cholera prevention and control. Objectives and strategic plans as identified by each individual country are shown in Table 8.

Figure 6: Countries' aims for cholera prevention and control

	Eliminate cholera by 2020 / 2025 / 2030 = No local transmission for three years in a row	Cambodia, Malaysia, Thailand, Vietnam
	Recognize cholera as a public health issue Set-up robust surveillance systems to better understand cholera design adequate action plan	Bangladesh, India, Indonesia, Nepal, Pakistan, Philippines

To answer the second question, countries worked on 5 main areas to list the strategic initiatives needed to cover the gaps and hence to reach the objectives (Figure 7)

Figure 7: Main areas to be improved for cholera prevention and control



The most critical initiatives listed during the brainstorming in each of the five cited areas are the following.

Strategic initiatives: Surveillance



Implement or strengthen surveillance system, in order to be sustainable and generate meaningful & actionable data

- ➡ Deploy surveillance system at local level for nationwide coverage
- ➡ Involve private healthcare sector
- ➡ Strengthen laboratory and field capacity throughout the country (culture, RDT)
- ➡ Analyze and disseminate data regularly
- ➡ Take a holistic approach to surveillance: passive + active surveillance, surveillance for population + environment

Strategic initiatives: WASH



Implement / Speed up WASH implementation

- ➡ Get communities on board for them to cooperate in WASH implementation
- ➡ Raise awareness on hand washing, open defecation, hygiene, food safety
- ➡ Ensure manageable, safe and monitored water supply
- ➡ Develop WASH packages adapted to local population
- ➡ Focus efforts on schools
- ➡ Implement food & water safety laws

Strategic initiatives: OCV



Plan for effective OCV campaigns in conjunction with WASH

- ➡ Accurately map hot spots / high risk areas
- ➡ Advocate for use of OCV in these areas
- ➡ Forecast demand
- ➡ Conduct cost-effectiveness study
- ➡ Set up vaccination impact monitoring

Strategic initiatives: Social mobilization & health promotion



Empower population

- ➔ Enhance community participation through community-led programs
- ➔ Run advocacy / awareness campaigns in schools and media
- ➔ Tailor campaigns to local specificities (language, culture)
- ➔ Link cholera to other existing health programs

Strategic initiatives: Collaborations



Strengthen collaborations between all partners & stakeholders

- ➔ Collaborations between central / provincial / local authorities
- ➔ Collaborations with local health units
- ➔ Collaborations with UNICEF, WHO, Save The Children...
- ➔ Collaborations between government, professional bodies, civil society, medical associations...
- ➔ Inter-sectorial collaborations
- ➔ Cross-boarder collaborations

Table 7: Strengths and gaps identified by each participating country

Country	Strengths	Gaps
Bangladesh	<ul style="list-style-type: none"> ✓ Feasibility and effectiveness of a mass cholera vaccination program and behavior changes in decreasing the high incidence of cholera demonstrated (rural + urban areas) ✓ Establishing demographic surveillance system to monitor severe diarrhea illness attributable to cholera in target population (in studies performed) ✓ Successful experience in countrywide vaccination (measles rubella) ✓ Transfer technology to Bangladesh for local OCV production ✓ OCV acknowledged as part of integrated strategy and included in national plans 	<ul style="list-style-type: none"> ✓ Trials to run with vaccines to be locally produced ✓ Countrywide surveillance to be strengthened to identify high risk areas for cholera ✓ Lack of Reporting system
Cambodia	<ul style="list-style-type: none"> ✓ CamEWWARN and Sentinel surveillance systems (weekly reporting, including of suspected cholera cases) ✓ Cross-border investigation with Vietnam 	<ul style="list-style-type: none"> ✓ Suspected cases not diagnosed, not brought to hospitals ✓ Need further outbreak investigations
India	<ul style="list-style-type: none"> ✓ Reporting system existing in all regions: weekly surveillance system ✓ Guidelines & SOP shared with districts for prevention and management of outbreaks: early case detection and referral mechanism; case base surveillance; key informants at village level identified for early information ✓ Success in awareness campaign for MDD ✓ New capacity to implement disaster risk management programs 	<ul style="list-style-type: none"> ✓ Sharing sanitation facilities with other households ✓ Lack of designated hand washing area, soap or ash ✓ Poor availability of safe drinking water supply ✓ Inadequate ownership of programs ✓ Poor local health infrastructure ✓ Inadequate priority setting ✓ No adequate analysis of risk of cholera outbreaks ✓ Fears from government to extend vaccination program ✓ Need for data from other countries such as Bangladesh to overcome these fears
Indonesia	<ul style="list-style-type: none"> ✓ Promotion of breast feeding, hygiene practices etc. against diarrhea by MoH 	<ul style="list-style-type: none"> ✓ Absence of vaccine ✓ Only 40% households practice healthy and hygiene behavior ✓ 10% of households with no defecation facilities ✓ Absence of rapid diagnosis test ✓ Absence of search for cholera in rural settings

Table 7: Continued

Country	Strengths	Gaps
Malaysia	<ul style="list-style-type: none"> ✓ Existence of web-based notification system for surveillance ✓ Cases notified: syndromic, suspect and confirmed ✓ Laboratory diagnosis capabilities in all hospitals ✓ Good political commitment, interagency collaboration ✓ More financial investment for sanitation and water supply ✓ Legal approach for child education, case notification and management, food sanitation ✓ Free treatment and quarantine leave for working parents ✓ Existence of national guidelines for cholera clinical management and for outbreak control ✓ Hygiene promotion and social mobilization (community empowerment) 	<p>In Sabah:</p> <ul style="list-style-type: none"> ✓ Poor access to clean water and sanitation in areas (scarce safe water supply, environmental issues, poor hygiene & food sanitation)
Nepal	<ul style="list-style-type: none"> ✓ National public health laboratory to confirm cholera cases ✓ Comprehensive Targeted Interventions (CTI ring strategy) to control cholera in Kathmandu Valley ✓ Door to door awareness campaign and community level interventions (municipality, schools, food authorities) ✓ Initiatives to improve water quality and cooperation with jar vendors ✓ Creation of a Task Force for cholera control ✓ Experience in good OCV vaccination coverage in 2 districts recently ✓ Multi-year plan 2017-2022 	<ul style="list-style-type: none"> ✓ Inadequacy of existing surveillance to cover all the districts ✓ Suboptimal WASH status ✓ Need for comprehensive and integrated intervention of enhanced surveillance, investigation and WASH response ✓ Need for enhanced collaboration and coordination across multiple stakeholders ✓ Advocacy needed to introduce the OCV vaccination ✓ Roadmap to be developed urgently ✓ Lack of access to drinking water ✓ Lack of diagnostic facilities in rural areas ✓ Lack of continuity in political actions
Pakistan	<ul style="list-style-type: none"> ✓ Primary health care system exists across the country ✓ National institute of health has a central lab to confirm the diagnoses ✓ Punjab has a facility based surveillance system 	<ul style="list-style-type: none"> ✓ Lack of surveillance system ✓ Scarcity of data due to lack of systematic studies ✓ Absence of political emphasis on cholera and cholera action plan ✓ Lack of access to clean drinking water ✓ Some population without access to sanitation facilities ✓ Limited laboratory capacity

Table 7: Continued

Country	Strengths	Gaps
Philippines	<ul style="list-style-type: none"> ✓ DOG recognizes the need for a new vision in sanitation, expressed in clearer policy and action programs ✓ Zero Open defecation Program ✓ DOH helps Local Government Units building the competencies of CLTS facilitators in planning and implementing interventions to address open defecation in communities through CLTs ✓ Regional epidemiology & surveillance units / regional program coordinators ✓ Towards integrated approach: Food & water-borne program 	<ul style="list-style-type: none"> ✓ Need for strong community empowerment to implement successfully ZODP ✓ Varying capacities in diagnosis and treatment ✓ Limited vaccination
Thailand	<ul style="list-style-type: none"> ✓ Cholera considered seriously by government ✓ Hospital-based surveillance system (early detection of suspected cases, lab confirmation) ✓ Trained Surveillance and Rapid Response Teams (1030 teams nationwide) since 2011 ✓ Improving sanitation and safe water supply (e.g. almost 100% of households with sanitary toilet) ✓ Use of oral cholera vaccine in a special setting ✓ Existence of clinical practice guidelines available also in rural areas ✓ Existence of 12 regional laboratory centers ✓ Investigation and control of cholera outbreaks 	<ul style="list-style-type: none"> ✓ Need to improve sanitation and chlorination of water supply (e.g. in migrant worker community)
Vietnam	<ul style="list-style-type: none"> ✓ Investigation of reasons behind epidemic waves ✓ Vaccination program deployed in 16 provinces with higher incidence ✓ Legal framework ✓ Global Health Project to enhance capacity of health system in the surveillance, early detection, coordination and response to diseases outbreaks ✓ Strengthened active surveillance to detect for early detection of cholera in environment and foods ✓ National guideline on cholera diagnosis and treatment ✓ Local production capacities for oral cholera vaccine 	<ul style="list-style-type: none"> ✓ Close collaboration between related sectors ✓ Deficient activities on cholera control and prevention in the community (education, clean water supplies and sanitation, food hygiene and safety, oral cholera vaccination) ✓ Lack of collaboration among neighbor hooding countries

Table 8: Objectives and strategic plans per participating countries

Country	Objectives	Strategic plans
Bangladesh	✓ Control cholera by 2025 (not a public health issue anymore)	<ul style="list-style-type: none"> ✓ Establish diagnostic tools in district hospitals ✓ Obtain license for Cholvax by end 2017 ✓ Report cases to XHO ✓ Establish collaborations between government, professional bodies (e.g. pediatric medical association) and civil society) ✓ Use surveillance to show vaccination efficacy (impact study)
Cambodia	✓ Eliminate Cholera by 2030	<ul style="list-style-type: none"> ✓ Advocating that cholera is not just health problem but a social economic and development problem ✓ Strengthen Political commitment to consider cholera as first priority ✓ Advocating following One Health Approach ✓ Integration activities between department and inter-Ministry ✓ Inter country Collaboration, mobilize community resources ✓ Information, Education, Communication (IEC) to increase awareness and change behavior of community ✓ Establish and Strengthen Active and passive Cholera surveillance system: capacity building, training, government guidelines surveillance, equipment facilities ✓ Legal enforcement ✓ Strengthen EWAR (early warning alert response) ✓ Surveillance on environmental sanitation ✓ Update guidelines on diagnosis, case management and outbreak response ✓ Strengthen National program for water sanitation to improve indicators using clean water and toilets ✓ OCV campaign for high risk population and location ✓ Regional and global strategy for cholera elimination ✓ Vaccine stockpile ✓ International Support ✓ Regional task force on outbreak response

Table 8: Continued

Country	Objectives	Strategic plans
India	<ul style="list-style-type: none"> ✓ Recognize cholera / severe diarrhea as a public health problem ✓ Cholera should be aligned with development agenda and health outcomes ✓ Set-up sustainable and functional surveillance system 	<ul style="list-style-type: none"> ✓ Introduce vaccine ✓ Speed WASH ✓ Delivery of existing tools (vaccine, diag tests...) ✓ Create political will and bridge research policy gaps ✓ Implement awareness / communication / advocacy
Indonesia	<ul style="list-style-type: none"> ✓ Build a National action plan for Cholera ✓ Improve surveillance system in high prevalence diarrhea regions. ✓ Introduction of Vaccine in high risk groups and during disaster outbreaks. ✓ Improve sanitation and hygiene. ✓ Increase Cholera awareness and education 	<ul style="list-style-type: none"> ✓ Build a National Action Plan for Cholera aligned with WHO declaration ✓ Establish a surveillance program for Cholera within the existent surveillance for other Diarrheal disease, optimizing from the good existent laboratory capacity in the country. ✓ Educational programs deployment for behavioral changes in sanitation. ✓ Improve current program for sanitation through investment and deployment ✓ Enable laboratory confirmation and RDT case confirmation ✓ Introduction of vaccination programs in high risk groups and during natural disaster. ✓ Educational programs for Cholera awareness and tailored for Ethnic groups and cultural requirements ✓ Strengthen National program for water sanitation to improve indicators using clean water and toilets ✓ Regional and global strategy for cholera elimination ✓ Vaccine stockpile ✓ International Support ✓ Regional task force on outbreak response ✓

Table 8: Continued

Country	Objectives	Strategic plans
Malaysia	<ul style="list-style-type: none"> ✓ eliminate Cholera, by 2020 ✓ no local transmission for 3 years 	<ul style="list-style-type: none"> ✓ Advocating that cholera is not just health problem but a social economic and development problem ✓ Strengthen Political commitment to consider cholera as first priority ✓ Advocating following One Health Approach ✓ Integration activities between department and inter-Ministry ✓ Inter country Collaboration, mobilize community resources ✓ Information, Education, Communication (IEC) to increase awareness and change behavior of community ✓ Establish and Strengthen Active and passive Cholera surveillance system: capacity building, training, government guidelines surveillance, equipment facilities ✓ Legal enforcement ✓ Strengthen EWAR (early warning alert response) ✓ Surveillance on environmental sanitation ✓ Update guidelines on diagnosis, case management and outbreak response ✓ OCV campaign for high risk population and location
Nepal	<ul style="list-style-type: none"> ✓ Eliminate Cholera by 2025 (not a public health issue anymore); Develop NAP 	<ul style="list-style-type: none"> ✓ Strengthen existing sites and expand coverage ✓ Monitor water quality and ensure proper chlorination ✓ Use strong network of female community health volunteers to promote hygiene at common Level ✓ Advocate importance of OCV in conjunction with WASH ✓ Development of WASH promotion packages in different local languages ✓ Involve medias ✓ Establish effective partnerships with relevant stakeholders

Table 8: Continued

Country	Objectives	Strategic plans
Pakistan	<ul style="list-style-type: none"> ✓ Understand the situation → Convince politicians to fight cholera → Develop NAP 	<ul style="list-style-type: none"> ✓ Extend case reporting outside Punjab to all provinces ✓ Develop district laboratories for culture + rapid test ✓ Involve private sector & medical colleges ✓ Educate, provide safe water, provide gender segregated toilets, in schools ✓ Assess OCV demand ✓ Develop NAP including provincial governments for policy and budget allocation + covering disaster management
Philippines	<ul style="list-style-type: none"> ✓ Recognize cholera / severe diarrhea as a public health problem ✓ Cholera should be aligned with development agenda and health outcomes ✓ Set-up sustainable and functional surveillance systems 	<ul style="list-style-type: none"> ✓ Introduce vaccine ✓ Speed WASH ✓ Implement awareness / communication / advocacy ✓ increase capacity of local healthcare workers
Thailand	<ul style="list-style-type: none"> ✓ Eliminate autochthonous transmission of cholera. ✓ Identify high risk populations amongst migrants and fishermen. ✓ Early detection and timely control of cholera outbreaks. 	<ul style="list-style-type: none"> ✓ Build a National Action Plan for Cholera elimination ✓ Mapping hot spots and survey high risk populations. ✓ Establish an enhanced cholera surveillance system and a WASH program in the migrant communities ✓ Conduct cost-effectiveness studies and use results to advocate for vaccine introduction programs. Develop national expertise and network for research among ASEAN members ✓ Use of laboratory diagnostic test and RDTs for case confirmation and early detection of cholera. ✓ Expand health services to migrant populations.

Table8: Continued

Country	Objectives	Strategic plans
Vietnam	<ul style="list-style-type: none"> ✓ eliminate Cholera by 2030 	<ul style="list-style-type: none"> ✓ Advocating that cholera is not just health problem but a social economic and development problem ✓ Strengthen Political commitment to consider cholera as first priority ✓ Advocating following One Health Approach ✓ Integration activities between department and inter-Ministry ✓ Inter country Collaboration, mobilize community resources ✓ Information, Education, Communication (IEC) to increase awareness and change behavior of community ✓ Establish and Strengthen Active and passive Cholera surveillance system: capacity building, training, government guidelines surveillance, equipment facilities ✓ Legal enforcement ✓ Strengthen EWAR (early warning alert response) ✓ Surveillance on environmental sanitation ✓ Update guidelines on diagnosis, case management and outbreak response ✓ Strengthen National program for water sanitation to improve indicators using clean water and toilets ✓ OCV campaign for high risk population and location ✓ Regional and global strategy for cholera elimination ✓ Vaccine stockpile ✓ International Support ✓ Regional task force on outbreak response

Conclusions

In South Asia, some countries such as Vietnam, Malaysia and Maldives are already free of cholera and there is hope for others like Bangladesh.

All participating countries believe that there are strengths in their prevention and control programs and agree that:

- ✓ Cholera should be recognized as a public health problem;
- ✓ Delivery and implementation of existing tools is important;
- ✓ Surveillance systems should be sustained;
- ✓ OCV should be introduced and used in different ways according to the country situation.
Indeed, OCV could be targeted to special population, integrated in the EPI program or used in emergency situations;
- ✓ Data should be collected in order to assess the effectiveness of one-dose of OCV programs;
- ✓ Better advocacy and communication to the general population, politicians and stockholders is warranted;
- ✓ There is a need to build-up a cholera repository;
- ✓ Research should be bridged to policy gap;
- ✓ Vaccine price should decrease by multiplying procedures and manufacturers;
- ✓ Diagnostic should go to the lowest point of care.

The review of existing interventions on cholera prevention and control in Asia by stakeholders present during the meeting provided evidence that despite tremendous efforts so far, prevention and control of cholera suffers from a number of challenges and issues. According to the UNICEF, the world has missed the Millennium Development Goals (MDG) sanitation target with more than 47 countries, territories and areas where less than half of the population uses improved sanitation. Key pathways to prevent cholera are access to safe water supply, end of open defecation, and increased hygiene.

WASH was identified as the major instrument of development as well as means for gender parity. However, WASH related advocacy activities as agreed in the GTFCC have not been implemented. Besides, WASH responses are often reactive rather than proactive, and criteria to trigger WASH response are often unclear. Funding of WASH priorities remains a challenge. Priority WASH interventions in emergency situation should include:

- ✓ Increase water supply
- ✓ Improve quality of water supplied

- ✓ Increase access to excreta disposal facilities
- ✓ Provide hygiene kits, hand washing facilities, soap and water storage vessels
- ✓ Reduce vector breeding sites
- ✓ Solid waste collection and disposal
- ✓ Hygiene education/ social mobilization

Cholera is vaccine preventable disease and the added advantage of herd protection offered by vaccination can be expected to decrease significantly the number of cases. Cholera stockpile is a very important tool in cholera prevention and control and its usefulness has been shown in different situations. IVI was a fundamental actor in OCV development. Indeed, thanks to several technology transfer collaborations, the future OCV stockpiles will grow with more vaccines being manufactured by different companies. However, demand is also increasing. The use of one-dose OCV regimen could be a promising solution during emergency situations. Several studies are ongoing to investigate the effectiveness of such strategy. Other innovative OCV delivery strategies are being tested. This includes:

- ✓ A self-administered second dose for the fishermen in "floating homes" living on Lake Chilwa. This experience is carried out by MSF in 6000 population. The second dose is given together with first dose that will be home-based self- administration (2 weeks apart)
- ✓ A Community-led self-administrated second dose on the 6 islands of Lake Chilwa carried out by AMP in 7000 population. The second dose is given to community leaders at the end of the first round, and kept in large cool boxes and will be administrated under direct observation of the leader.

Furthermore, evidence supports that killed whole cell vaccines are stable at high temperature for long periods [Ahmed 1994; Saha 2016]. Therefore, vaccine can be kept under cold chain in central stock, but used out of the cold chain during distribution. This will allow the transport of vaccine to hard-to-reach areas. A trial carried out in Guinea in 2012 showed high protection despite the heat exposure.

In conclusion, cholera is not only a health problem; it is the direct consequence of poor sanitation and poor quality and inadequate water supply, linked to various environmental, climatic and socio-economic situations. Cholera can be prevented and controlled via complementary, synergistic and multidisciplinary interventions such as prompt case management, WASH [Baker 2016, Taylor 2015], and vaccination.

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