Original Article

Managing Cholera in Limited Resource Settings: The Case of the Lusaka Cholera Epidemic of 2009-2010

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ABSTRACT

Purpose is to illustrate that even with limited resources cholera can still be managed adequately to controllable levels which significantly reduce on the morbidity, mortality and excess drain on resources.
Material and methods

A situational analysis was made upon whose basis interventions were constituted. These included contact tracing, social marketing and behavioral intervention. Communities were engaged on cholera and their contribution towards its negative impact and how they could help ameliorate the situation.

Active intervention was done on the stagnant pools of water and to kill the cholera bug.

Results: There was significant reduction in cholera cases which came down to zero over the three years that the interventions were instituted.

Conclusion: Even in resource-limited settings, cholera can still be managed adequately if worked on proactively.

INTRODUCTION

Cholera

Cholera has become endemic in Zambia since the 1979/1978 outbreak. Zambia had a major outbreak in 1990 and since then, it has registered cholera cases yearly except for 1994/1995 season. Most cases are in the fishing camps and peri-urban areas of Lusaka and the Copperbelt. In Lusaka, severe cases and deaths have occurred mostly in the western suburbs where sanitation has generally been poor.

In the 2009/2010 season, a total of 6804 cases of cholera were reported from Southern, Copperbelt, Northern and Lusaka provinces and this was aggravated by the heavy rain season. In Lusaka, there was a total of 4464 cases and 73 deaths recorded from 1st January to March 2010. The Lusaka District Health Management team was tasked to deal with the cholera outbreak, upon which a cholera task force was formed.

By World Health Organization (WHO) definition, Zambia has been confirmed a cholera endemic country.

"The working group developed the following definition of endemic cholera to guide control strategies: the occurrence of faecal culture-confirmed cholera diarrhoea in a population in at least 3 of the past 5 years." (WHO, 11 December 2009)

What is cholera?

"In the majority of cases, cholera is characterized by acute, profuse watery diarrhoea of 1 or a few days' duration. In its extreme manifestation, cholera is one of the most rapidly fatal infectious illnesses known.

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Within 3–4 hours of onset of symptoms, a previously healthy person may become severely dehydrated and if not treated may die within 24 hours." (WHO, 26 March 2010, vol. 85, 13 (pp 117–128), p. 120)

Situation analysis

A review of the previous year's management strategies and methods of treatment and approach. Strength and weaknesses were identified, and it was found that there were a lot of opportunities as well. The Ministry of Health (MoH) was willing to help and had a lot of co-operating partners.

It was realised that there was too much reliance on external efforts and the whole method of approach was on a wait and see basis. There were two large cholera treatment centres in Chawama and Matero and two smaller centres in Chipata and Kanyama. There were six ambulances in total- four runners that were used for both general and cholera patients. Two ambulances were broken down.

There was a shortage of water and inadequate chlorine during the peak of the outbreak.

Interviews of the general population in the affected are as revealed that the majority knew that cholera was a disease of filth though no one thought that they themselves were filthy enough to spread or contract cholera. There were too many Non-Governmental Organisations (NGOs) spreading out their own campaigns in the community.

The government had started to dig drainage trenches around Kamwala which however were open and instead filled with rubbish.

The environmental health department had no vehicle and had to rely on pool vehicles to do contact tracing. However, during the peak of the outbreak, a lot of resources were availed though, not used in a prudent manner but in a management by crisis manner. It was decided to change the approach and adopt a more proactive style.

Materials and Methods

We set out to address the concerns highlighted above. It was decided not to wait for the cholera outbreak but to start preparedness for cholera right from week 42,(Towards the end of October)which is before the onset of rains that are known to coincide with cholera epidemic (Luque Fernández et al. 2009)

There were 29 clinics. A cholera management unit was setup at every centre that catered for at least 5,000 people. At least two cholera beds were setup in a tent. A similar arrangement was done at the University Teaching Hospital. Patients were only to be transferred to the main cholera treatment centre in Matero if in two days they did not respond to treatment.

All the nurses and clinical officers in cholera management sites underwent refresher courses in cholera diagnosis and management with financial support from WHO.

Two non-runner ambulances were repaired, and another two new ones were secured from the Disaster Management and Mitigation Unit (DMMU). The environmental health department's four-wheel drive vehicle was repaired, and it was equipped with a public address system.

Cholera test kits were procured to ensure documentation of positive cases at admission.

The city was divided into two major zones, south and north. The northern zone had its major cholera centre at Matero Clinic, whilst the southern zone was headquartered at Chawama Clinic; the idea being to station two ambulances a piece north and south, in order to avoid traffic congestion which occurs during the rush hours, from affecting the transportation of the patients. This way the town centre was by passed.

Campaigns were conducted on both private and public, radio and television stations at no cost. Companies were lobbied for support and there were overwhelming responses. NGOs expressed corporate and social responsibility through donations of chlorine in either granular or liquid form. Other NGOs offered to help with campaigns under the auspices of the District Commissioner.

The Ministry of Health supplied the necessary intravenous and oral fluids that were needed to treat

cholera patients. The second phase of the programme was thus awaited.

The index case was at Chipata clinic where two patients were admitted. We did contact tracing and found the patients had given false home addresses with the true address only being revealed after educating the patients on the importance of contact tracing. The patients both came from Zingalume, an unplanned settlement on the outskirts of George compound.

The area was tackled on three fronts using social marketing theories and health behaviour theory. (Bandura 1991) which state that a person or society are likely to change their behaviour if they can directly see the consequences of their behaviour. With the public-address system, we covered a minimum of 500 metres radius warning about the cholera outbreak in the region.

The two index cases had no toilet. The land Lord was ordered to construct a toilet within 3days. He was warned that he could be prosecuted for not availing a toilet to his tenants. The area was searched for shallow wells. The wells that were found were over chlorinated. Thus, rendering the water undrinkable but could be used for other domestic purposes. Bottled chlorine was supplied courtesy of our cooperating partners to every contact of admitted patients. It was easier at times when the contacts were family members.

At these, door to door campaigns, emphasis was placed on toilet hygiene, drinking safe water and using soap during hand washing. Then a bottle of chlorine was given per household member which was theoretically enough to last the season. They were informed that they could collect more chlorine from the local clinic should the need arise. They were cautioned that their health is in their hands and that they were the agent of change (Bandura 1990)

This was repeated throughout the season and the number of vehicles used in these campaigns was increased to three at peak and more nurses were incorporated in the campaigns.

RESULTS

By March 2011 our figures are as tabulated below. The number of cases dropped from 4464 to 117 and the number of deaths from 73 to 1 in Lusaka province alone(January to March figures).

	Jan 2010 to Mar 2010	Jan 2011 to Mar 2011
Cases	4464	117
Deaths	73	1

At the end of the rain season up to April/May the final figures were as follows for the years 2009 to 2013.

In 2011 May the total number of deaths was 4 deaths, with one being a brought in dead (BID) and the remainder of the deaths had cultures that were negative for cholera. This aggressive approach was continued until 2012/2013 when zero cases were recorded.

Table 1: Cholera burden in Lusaka, 2009 – 2013

	SEASONS			
	2009/10	**2010/11**	**2011/12**	**2012/13**
Total cases	5684	219	3	0
Discharged	5481	215	3	0
BID*	41	1	0	0
Total deaths	203	4	0	0

Note: BID is a subset of total number of deaths

**BID= Brought In Dead*

Table2: Cholera distribution by age during 2010/11 season

Count of Age in years	2010/ 11 season
Age in years	**Total**
0-4	39
5-9	21
10-14	12
15-19	9
20-24	24
25-29	28
30-34	24
35-39	24
40-44	10
45-49	7
50-54	4
55-59	4
60-64	5
65-69	4
70-74	3
85-90	1
Grand Total	**219**

Of note in this table is that a large number of children were affected which is a result of their parents' poor hygiene standards.

DISCUSSION

Cholera is disease which is believed have been there in Asia since 400BC and later spread to Europe in the 1829-31. It claimed its first victim on 20th October 1831 in the United Kingdom. Since then there have been a number of pandemics of the disease. Six pandemics have been recorded from 1817 -1923 with the current one (seventh) since 1961

"British physician John Snow (1813-1858) explained the association of a terrible cholera outbreak in London in 1849 to contamination of the drinking water supply with human excreta. Despite his finding, the causative agent of this dreaded illness was unidentified until later in the 19th century. In 1854, Filippo Pacini (1812-1883) an anatomist from Italy and then in 1883, Robert Koch (1843-1910) the German bacteriologist, discovered 'vibrio cholerae' as the etiologic agent" (Azizi and Azizi 2010).

Several vaccines have been developed with two seemingly effective oral vaccines in recent years. Treatment guidelines have been developed (World Health Organization 1994) which have helped to reduce the case fatality rates to less than 1.5%. Developed counties with their excellent sanitation and clean water facilities have almost eliminated cholera in their countries.

Despite all this however we are still in the seventh pandemic with a major contribution from developing countries with poor sanitation. In Africa where sanitation is generally poor has been severely hit by cholera "The seventh cholera pandemic has heavily affected Africa, although the origin and continental spread of the disease remain undefined" (Weill et al. 2017).

In Zambia we remain endemic despite all the measures that we know antibiotic vaccines and clean ups when an outbreak occurs. Effective as they are these measures come at great cost. A feasibility study to stock vaccines for Zimbabwe in 2013 came to 5.5-13.9 US $. The authors wrote "we recommend a stockpile that starts at 2 million doses, with an estimated annual cost of $5.5-$13.9 million in 2013, and grows to 10 million doses per year by 2017, with an annual cost of $27-$51 million." (Maskery et al. 2013)

This we can deduce is not a cheap option for any African country inclusive Zambia.

The permanent solution remain improved sanitation and clean water supply. However in the experience we had and the measure put in place in 2010 were continue dup to 2014 with a revolving fund for the cholera preparedness. This included stocking up of enough chlorine in readiness for cholera. Vigilance was maintained in engaging the community. Preparation of cholera treatments sites. Towards the beginning of every rain season training were undertaken in readiness for possible cholera outbreak. Every rain season was treated as a potential cholera outbreak because all the conditions for an outbreak still existed. These include poor sanitation, poor hygiene and inadequate safe water supply.

The first year saw a dramatic decrease in the cases recorded. This finally led to an apparent cholera free environment despite the conditions for cholera existing.

CONCLUSION

Cholera is a hard disease to fight. It has been known for centauries but epidemics continue. It requires concerted efforts from all stake holders with a conscious awareness that Zambia is a cholera endemic society, even as the drainage and sanitation are being improved. Being prepared for cholera is far better than waiting to put out the fires after they are lit in keeping with the saying that "prevention is better than cure". Even with limited resources being proactive is still effective.

RECOMMENDATIONS

We recommend that from public health point of view all areas where cholera is still occurring should have a permanent preparedness committee ready to swing in action on the instance of an index case while the lasting solution will be to improve sanitation in the cholera prone areas.

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REFERENCES

1. WHO, 11 December 2009. 517 Meeting of the Strategic Advisory Group of Experts on immunization, October 2009 – conclusions and recommendations. Weekly Epidemiological Record (WER), 84(50), p. pp 517–532.
2. WHO, 26 March 2010, vol. 85, 13 (pp 117–128). 117 Cholera vaccines: WHO position paper. WEEKLY EPIDEMIOLOGICAL RECORD, Volume 85, p. 117–128.–
3. Bandura, Albert. 1991. "Social Cognitive Theory of Self-Regulation." *Organizational Behavior and Human Decision Processes* 50 (2): 248–87. https://doi.org/10.1016/0749-5978(91)90022-L.
4. — 1999. "Social Cognitive Theory : An Agentic Albert Bandura." *Asian Journal of Social Psychology* 2 (1): 21–41. https://doi.org/10.1111/1467-839X.00024.
5. Luque Fernández, Miguel Ángel, Ariane Bauernfeind, Julio Díaz Jiménez, Cristina Linares Gil, Nathalie El Omeiri, and Dionisio Herrera Guibert. 2009. "Influence of Temperature and Rainfall on the Evolution of Cholera Epidemics in Lusaka, Zambia, 2003-2006: Analysis of a Time Series." *Transactions of the Royal Society of Tropical Medicine and Hygiene* 103 (2): 137–43. https://doi.org/10.1016/j.trstmh.2008.07.017.
6. Maskery, Brian, Denise Deroeck, Ann Levin, Young Eun Kim, Thomas F. Wierzba, and John D. Clemen.
7. s. 2013. "Strategy, Demand, Management, and Costs of an International Cholera Vaccine Stockpile." *Journal of Infectious Diseases* 208 (SUPPL. 1). https://doi.org/10.1093/infdis/jit233.
8 Weill, François Xavier, Daryl Domman, Elisabeth Njamkepo, Cheryl Tarr, Jean Rauzier, Nizar Fawal, Karen H. Keddy, et al. 2017. "Genomic History of the Seventh Pandemic of Cholera in Africa." *Science* 358 (6364): 785–89. https://doi.org/ 10.1126/science.aad5901.
9. World Health Organization. 1994. "Guidelines for Cholera Control." *Health Policy* 27 (2): 197. https://doi.org /10.1016/0168-8510(94)90083-3.