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HIGHLIGHTS OF THE JAN– MAR 2016 QUARTER

Supplemental Polio Immunization Campaigns: Uganda to introduce IPV into routine immunization schedule

Uganda is at increased risk of polio outbreaks due to the political unrest in its neighbors, the porous nature of our borders, massive cross border movements and an influx of refugees especially in areas with low performance in routine immunization and poor surveillance indicators. An outbreak of polio in South Sudan was confirmed on 24th November 2014, where 2 cases of circulating vaccine-derived polio (cVDPV2) were identified in Unity state. Presence of cVDPV2 is an indication of ongoing weaknesses in routine immunization efforts in affected areas. Such cVDPV2 incidence9s need to be eliminated before the withdrawal of trivalent oral polio vaccine (tOPV). Therefore multiple supplemental immunization campaigns with tOPV have been planned in all countries with an ongoing cVDPV2 outbreak or at high risk for such an outbreak if the end game strategic plan goals are to be realized.

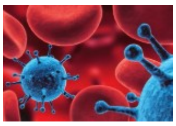
Uganda therefore has planned several supplemental immunization activities (SIAs) with tOPV to ensure full protection of all children <59 months before the switch. This switch from tOPV to bOPV is scheduled for April 2016. It's a globally synchronized replacement of all tOPV with bivalent OPV (bOPV) containing only types 1 and 3 polioviruses. To prepare for the global switch from tOPV to bOPV, as recommended in the Polio eradication and endgame strategic plan 2013–2018, the WHO strategic advisory group of experts (SAGE) on immunization recommended that at least one inactivated Polio Vaccine (IPV) dose be introduced into routine immunization schedules in all countries. The IPV will help protect against paralytic polio caused by type 2 polioviruses, provide a degree of population protection against type2 poliovirus outbreaks, facilitate responses to any cVDPV2 outbreaks after the switch to bOPV, and aid in eradicating wild polio virus by boosting immunity to types 1 and 3 polioviruses. The first round of SIAs was implemented from 21st-23rd January 2016 in 57 high risk districts.

This will be followed by the national house to house polio campaign from 1st to 3rd April 2016 that will cover children <5years using tOPV. Subsequently inactivated polio vaccine (IPV) will be introduced into routine immunization at 14 weeks together with OPV3 starting 18th April, 2016. This will then be followed by another round of SIAs using tOPV in 65 high risk districts before the national switch day on 29th April, 2016.

CPHL moves to its new home


The new CPHL Building in Butabika.

On 15th January 2016, the CPHL offices was officially handed over to MOH. The CPHL block, located in Butabika, just opposite the Butabika national mental Referral hospital main gate, was constructed with support from the US Centers for Diseases Control (CDC).



Disease Outbreaks

Yellow fever : On 24/03/2015 Masaka district alerted MoH of a strange illness that had killed 3 people in in one family. Investigations confirmed yellow fever. Response including case management at Masaka RRH social mobilization and active case finding are ongoing. By 15th March 2015, a total of 18 suspected cases including 5 laboratory confirmed cases, with 9 deaths (CFR=50%) were documented. Buwungu sub-county is the most affected (attack rate=).

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EDITORIAL

Dear Reader,

Welcome to the second issue of the quarterly epidemiological bulletin of the Uganda National Institute of Public Health (UNIPH). This bulletin aims to inform district, national and global stakeholders on the public health interventions undertaken in disease prevention and control. In this issue, we share with you some highlights such as the supplemental polio immunization campaign, and a number of outbreaks responded to and investigated such as Rift Valley Fever (RVF) in Kabale district, Podoconiosis, Measles among others. We also bring you an Evaluation of Acute Flaccid Paralysis Surveillance System in Northern Uganda - a very timely assessment as the country transitions to the bivalent Polio vaccine and also introduces the inactivated Polio Vaccine. ***In case you would like to access references used in this issue, feel free to contact us at: Inabukenya@yahoo.com OR ckihembo@musph.ac.ug.***

We will appreciate any feedback regarding the content and general outlook of this issue and we will be delighted to hear from you.

Thank you.

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Active Surveillance and case finding in Masaka and surrounding districts are ongoing

Cholera Outbreaks: There have been several cholera outbreaks in various districts in Eastern Uganda over the last 5 months. The disease outbreak was first confirmed in Busia district in October 2015 and over time cholera outbreaks have been reported in other neighboring districts including Mbale, Sironko, Bulambuli, Butalejja, Namayingo, Kapchorwa and Manafwa districts. By end of 30th March 2016, over 600 cumulative cases had been recorded in the region. Butaleja district has so far recorded the highest case fatality rate (5.5%). All districts reported Response and control efforts are currently ongoing. However, one of the greatest challenges respective districts have encountered in their control efforts, is lack of resources to facilitate community interventions, inadequate laboratory services to confirm the disease and shortage of medical supplies and protective gear. With the start of the rain season, it is anticipated that the outbreak will continue to spread and ravage the region unless more aggressive control efforts are implemented.

Risk factors for Podoconiosis, Kamwenge District September 2015

By Christine Kihembo,[1,2] B. Masiira,[1,2] W. Z. Lari3, G. Matwale[4], A. R. Ario[5], M. Musenero[2], M. Nanyunja,[3]

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In September 2015, following alerts of increased elephantiasis cases in Kamwenge District, we set out to confirm the diagnosis and identify risk factors for the illness to guide control efforts. Using standard case definitions we identified cases in affected communities and ruled out filariasis. In a case-control study we compared shoe use and feet-washing practices among 40 probable case-persons and 80 asymptomatic neighborhood control-persons, matched by age and sex. We identified 52suspected cases in 2 sub-counties including 40 probable cases; incidence=2.9/100,000/year (1980-2015). There was no apparent increase in cases over time. Case control findings showed that not wearing shoes at work and at home and delay in feet washing after work were significantly associated with development of Podoconiosis (OR_{MH}= 7.7; 95% CI:2.0-30). We verified that the reported elephantiasis was Podoconiosis, associated with prolonged foot exposure to soil. We recommended health education on foot protection and provision of protective shoes to Kamwenge residents.

Introduction: Podoconiosis is non-filarial elephantiasis characterized by asymmetrical lower limb lymphedema[1]. Podoconiosis is one of the neglected diseases yet it causes high levels of disability, reduced productivity and social stigma[2]. The disease is prevalent in the tropics with a prevalence of 5–10% among populations who work bare-foot on irritant volcanic soils[3]. In Uganda, the disease has been reported in Kapchorwa along Mt Elgon slopes and in Kabale district. Podoconiosis has never been documented in Kamwenge or surrounding districts[4].

In 2014, the World Health Organization (WHO) Uganda Country office was alerted of increased cases of elephantiasis Kamwenge district. A subsequent filarial mapping exercise ruled out filariasis. In August 2015, the WHO office received another alert of increasing cases of elephantiasis in Kamwenge district. The Ministry of Health (MOH) in collaboration WHO Uganda set up a team to identify the cause and risk factors for disease development in order to guide control interventions.

Materials and Methods: We conducted the investigation in Kamwenge and Busiriba sub-counties in Kamwenge district. Kamwenge district is located in Western Uganda and has a total population of 421,470 who are mainly involved in subsistence farming. Kamwenge is generally hilly with deep rich fertile volcanic soils.

We defined a Podoconiosis suspected case-person as a Kamwenge resident with bilateral asymmetrical swelling of lower limbs lasting ≥1month, plus ≥1 of the following: skin itching, burning sensation, plantar oedema, lymph-ooze, prominent skin markings, rigid toes, mossy papillomata. We collected approximately 2ml of venous blood and tested for filarial antigen using the immuno-chromatographic card test (ICT). A probable case was a suspected case with negative microfilaria antigen ICT result..
Between 22nd-29th September 2015, we conducted active case-finding in the affected communities.

Using standard questionnaires we interviewed initial case-persons and generated hypotheses. We tested the hypotheses in a matched case-control study and compared shoe use and feet-washing practices among 40 probable case-persons and 80 asymptomatic neighborhood control-persons, matched by sex and age (±5 years).

We collected five (5) soil samples at the surface and depth of 0.5 m from places around their homesteads where case-persons significant amount of time for free silicon and pH testing.

Results: By 31st September2015, we identified 52 suspected cases of Podoconiosis including 40 probable cases from Busiriba and Kamwenge sub-counties. The annual incidence rate based on the suspected cases was 2.9/100,000/year (1980-2015). Older people were more affected, mean aged 48 years, range 13-80 years. More females were affected with attack rate (AR) of 1.9/ 10,000 compared to 0.22/10,000 among Males. The commonest symptoms were plantar edema and lower limb skin itching. There was no genital involvement. Busiriba sub-county was more affected (AR 1.29/1000) compared (AR 0.65/1000) in Kamwenge sub-county (figure1). The epidemic curve showed stable number of cases over time (figure 1).

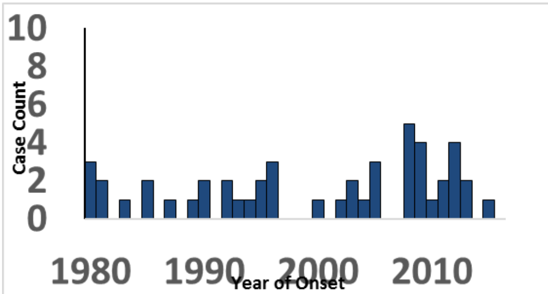

Fig 1: Epicurve of the Podoconiosis case patients in Kamwenge district.

Fig 2: Asymmetric Lymphoedema with mossy papillomata in a podoconiosis case patient in Kamwenge district.

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All case-persons resided in areas with a relatively high altitude (median: 1263m above sea level; range: 1163-1328m).

Hypothesis generation: Interview of 24 initial case-persons revealed that all (100%) were farmers engaged in digging and growing various crops; 14 (63%) never wore shoes while at work and 16 (67%) only washed their feet at the end of the day as they retired to bed and never washed their feet during the day.

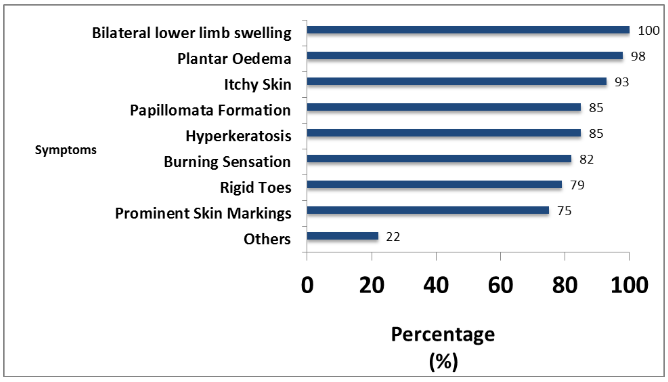

Fig 1:

Symptom distribution among Podoconiosis cases, Kamwenge, September 2015

Case-control study findings: Not wearing shoes at work was significantly associated with the illness (odds ratio [OR]MH= 7.7; 95% Confidence Interval [CI] 2.0-30); so was not wearing shoes at home (ORMH= 5.2, 95% CI;1.8-15) (Table 2). On stratified analysis, not wearing shoes neither at work nor at home 13 times more associated with developing Podoconiosis compared with wearing shoes both at work and at home (ORMH= 13, 95 % CI; 2.6-61). Similarly, only washing feet at the end of the day as they retired to bed (compared to washing feet within 2 hours after working in the fields) was associated with elevated disease odds (ORMH= 11; 95% CI; 2.0-56). Illness status was not significantly associated with the type, structure, or cover of the floor at the participant's homes or kitchen, nor with cultivating activities in valley areas or cultivating activities in the areas adjacent to the Kibaale Forest.

Much as more case-persons reported knowing at least one family member who had experienced similar symptoms, the association was not statistically significant when stratified in line of blood relations.

Laboratory findings: 40 suspected case-patients underwent ICT testing and all of them (100%) tested negative for filarial antigen on ICTs.

Soil analysis: Results pending, however soils in Kamwenge have been described as deep rich volcanic soils.

Risk factor	Odds ratio	P value	95% Confidence Interval
Wearing Shoes at:			
Work and Home	Reference		
Work Only	5.4	0.25	0.3-95.0
Home Only	3.6	0.15	0.6-21.1
Not wearing shoes at all	12.6	0.002	2.6-60.6
Washing feet after work:			
<2 hours	Reference		
2-4 hours	4.9	0.06	0.9-26.0
End of day (>4hours)	10.6	0.005	2.0-55.5

Table 2: Table2: Stratified analysis of risk factors for Podoconiosis, Kamwenge district, September 2015

Discussion: Podoconiosis has been documented to be as a result of interplay between environmental risk and personal factors that predispose an individual to prolonged exposure with irritant soils[2, 5, 6]. In this study we found that much as there were no differences in occupation among cases and controls, not wearing shoes while at work or at home before onset of the disease was strongly associated with disease. More still those who wore gumboots while at work where there is maximum risk of exposure, and those who washed to get rid of soil from their skins by quickly washing their feet were less at risk of Podoconiosis. This is in keeping with previous studies conducted in Ethiopia[7-9]. Unlike in the previous studies, this study however found no association between floor cover and disease.

Podoconiosis has been noted to have a genetic predisposition. Our investigation also found family clustering of the disease[3]. Much as more case-persons reported knowing at least one family member who had experienced similar symptoms, the association was not statistically significant when stratified in line of blood relations. The observed clustering could therefore be explained by family members being experiencing same risk factors.

Important to note is the fact that much as the case patients were observed to be using shoes after disease had been established, children and the general population in Kamwenge remained at risk, going about their business while with bare feet. Moreover, household members and other members of the public interfaced with during the study expressed not being in position to afford gumboots or shoes.

Risk factor	Number of participants		Exposure rate (%)		Adjusted Mantel-Hanszel odds ratio (95% CI)
	Case-persons	**Controls**	**Case-persons**	**Controls**	
Wearing shoes while at work					
No	37	54	93	68	7.7 (2.0-29.7)
Yes	3	26	7	32	**Reference**
Wearing shoes while at home					
No	32	39	80	49	5.2 (1.8-15.0)
Yes	8	41	20	51	**Reference**

Risk Factors for Measles Deaths in Children: Kyegegwa District, February - September 2015

By Mafigiri Richardson, Nsubuga Fred, Ario Alex Riolexus

Public Health Fellowship Program

On 18 August 2015, Kyegegwa District reported a cluster of 8 suspected measles deaths. We conducted an investigation to verify the cause, identify risk factors and inform control interventions. We conducted active community case-finding. In a case-control study we compared risk factors between 16 deaths (cases) and 48 probable measles patients (controls) matched by age and village of residence. We identified 94 probable measles patients; 68% of whom were below 5years with 16 deaths (CFR=25 %,). 63% of cases and 33% of controls received no vitamin A supplementation during illness, 31% of cases and 2.1% of controls were not treated according to standard guidelines; only 6.3% of cases and 46% of controls had been vaccinated against measles. In conclusion, receiving no vitamin A during illness, inappropriate treatment and not being vaccinated against measles increased risk for measles deaths. We recommended enhancing measles vaccination, providing universal vitamin A supplementation, and enforcing measles treatment guidelines.

Introduction: Measles is a highly contagious infection spread by droplet transmission.. In 2013 there were 145,700 measles deaths globally, majority of whom were below 5years [1]. From January - August 2015, Uganda experienced measles outbreaks in several districts in the western region including Kyenjojo, Mubende ,Isingiro and Kamwenge[2]. On 18 August 2015, Kyegegwa District reported a cluster of 8 suspected measles deaths. We went out to investigate the causes and risk factors for deaths in this outbreak.

Methods: We defined a probable measles diagnosis as onset of high fever (≥38OC), generalized maculopapular rash plus any of: conjunctivitis, cough or coryza between 1st February and 15th September in a Rwentuha sub-county Kyegegwa District resident; a case, as a death in a child (<5 years) with a probable measles diagnosis in the same period, and a control as a child (<5years) with a measles diagnosis in the same period who survived. We rigorously searched for cases and controls by working together with the village health team members. Using standard questionnaires, we interviewed parents/caretakers for both case and control-persons and also reviewed patient's records. It is scientifically known that prior measles vaccination and vitamin A supplementation during illness reduces the severity of illness and thus risk for measles death. Additionally malnutrition, young age and inadequate treatment are risk factors for measles deaths. We subsequently reviewed vitamin A supplementation during illness, treatment according to standard guidelines and measles vaccination status among 16 cases and 48 controls-persons matched by age and village of residence in a case control study. We collected blood specimen for measles diagnosis from the sick children.

Results: We identified 94 probable measles patients. 68% (64/94) of whom were children aged <5 years and all 16 deaths (case fatality ratio=25%, 16/64) were below 5 years. In the case-control study, 63% (10/16) of deceased measles cases and 33% (16/48) of controls received no vitamin A supplementation during illness (ORM-H=7.1; 95% CI=1.3-37); 31% (5/16) of deceased measles cases and 2.1% (1/48) of controls were not treated according to standard guidelines of managing measles (adjORML=∞; 95% CI=80-∞); 6.3% (1/16) of cases and 46% (22/48) of controls were vaccinated against measles (adjORML=0.0; 95% CI=0.0-0.33). Of the 14 blood specimens collected from probable measles patients, (10/14) 71% were positive for measles-specific IgM

Discussion : Our findings indicated that deaths were under the age of five (>5), indicating great danger of measles to infants as compared older age. These findings are in line with a study conducted in Niger, Nigeria and Chad [3, 4].The study also showed that a big proportion of deaths were not vaccinated. For the small fraction of cases who were vaccinated, it could have been ineffectiveness of vaccine as a result poor storage. For instance, towards the end of 2014, there was a cold chain break down in the district which could have affected the quality of vaccine. Meanwhile, almost a quarter of the cases were below vaccine eligible age (9 months) recommended for measles vaccination in Uganda. A numbers of factors affect the vaccination performance in the study area like in the study conducted in Nigeria [5]. Those identified include; people's negative perception towards vaccine, distance to the health centers, poor health education and poverty, and inadequate health facilities and personnel in the area of study. It was revealed that that Vitamin A supplementation during illness plays great role in boosting immunity, lack of vitamin A supplementation was associated with death of measles patients in this investigation and elsewhere [6]. Our findings also revealed that less than 10% among the deceased compared to 92% sought treatment from health facilities. This was in line with the high numbers of deaths that occurred at home compared to those that took place at health facilities. Similarly, the study done in Niger, Nigeria and Chad, 6% did not report to the any health facility citing reasons such as poverty, distance and ignorance [3]. The high percentage of death that occurred at home suggests that the locals still trust traditional treatment to conventional medicine in the cure of measles. It was noted that the community believed in the myth " that a measles case would die if at all he/she crossed a road." Others believe that treating measles with an injection causes death". Traditional behaviors in the study area influence the management of measles as in many other less developed countries [7].

Conclusion: During this measles outbreak, lack of vitamin A supplementation and lack of prior measles vaccination increased the risk for measles deaths. The one-dose measles vaccination in the current national vaccination schedule protected against measles death, even though it might not provide adequate protection against measles infection. We recommended enhancing measles vaccination among children and vitamin A supplementation during a measles illness.

A point-source Cholera outbreak caused by drinking contaminated water from a fenced lakeshore water-collection site, Kasese district, June 2015

By Pande Gerald[1], Kwesiga Benon [1], Kihembo Christine[1], Bwire Godfrey[5,] Ario Alex Riolexus[1]

1Public Health Fellowship Program, 2Ministry of Health

On 20th June 2015, Kasese District reported a cholera outbreak in a fishing village that had affected >30 persons. We investigated this outbreak to identify the mode of transmission and to recommend control measures. This cholera outbreak was caused by drinking water contaminated by faeces. At our recommendations, the village administrators rigorously disinfected all patients' waste, fixed the tap-water system, provided water treatment tablets, and issued water-boiling advisory. The outbreak stopped one week afterwards

Introduction: Uganda documented the first cholera outbreak in 1971[1]. Since then, the country has experienced sporadic cases and localised cholera outbreaks, occasionally resulting in prolonged widespread cholera epidemics. The frequency of these reported cholera cases varies among districts in Uganda [2].The most at risk areas include the border areas neighbouring the democratic republic of Congo (DRC), Sudan and Kenya as well as urban slums in Kampala.

Methods: On 20th June2015 Kasese District reported a cholera outbreak affecting more than 30 people within five(5) days in Katwe-Kabatoro Town council, Kasese district. We conducted an investigation to establish the mode of transmission and to recommend evidence-based control measures.

Katwe Kabatoro Town Council is located in Busongora South County in Queen Elizabeth National Park, Kasese district.The study population consisted of community members in Kyarukara village in Katwe-Kabatoro Town council.

We defined a suspected cholera case as onset of acute watery diarrhea in a Katwe Kabatoro Town council resident from 01st June 2015 onward; a confirmed case was a suspected case with culture-confirmed Vibrio cholerae in a stool sample. We actively identified cases by visiting affected community and updated line -lists obtained from the cholera treatment center. We assessed sources of water for drinking and for household use and assessed human waste disposal practices. We conducted descriptive analysis and interviewed 10 random case-patients on food and water exposures during the most likely exposure period.

Analytic study: In a case control study, we compared drinking water source points among 36 cases and 179 controls. Controls were asymptomatic Kyaruka village residents. One case per household was selected using simple random sampling in instances where there was more than one case.

Results: By 30th June 30, 2015, we had identified 61 suspected cases (attack rate=5.1%) with no death . The epidemic curve indicated an initial point-source outbreak followed by secondary transmission; after the primary cases onset on

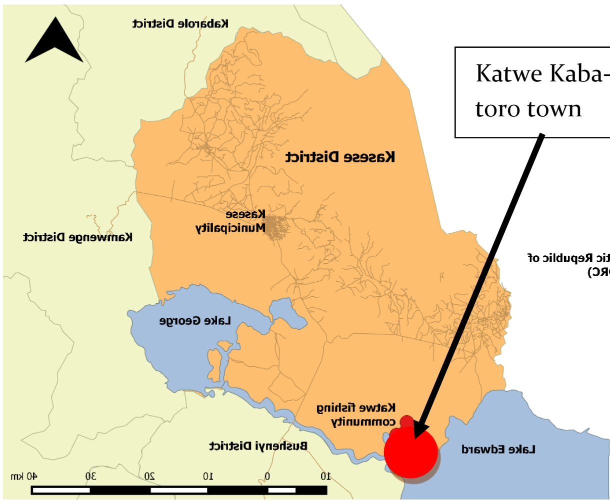

Figure 1 : A map of Kasese and the location of Katwe Kabatoro Town Council where cholera outbreak occurred in June 2015

16 June, cases rapidly increased and peaked on 19 June 2016 and rapidly declined afterwards; 8 scattered secondary cases occurred after 22 June 2016. Majority of cases (40.7%) were below 9 years, 20.4% were 20 -29 years as shown in figure1. Katwe-Kabatooro is a fishing village with relatively few older persons living in the area. Therefore the low numbers in the older groups may not indicate low attack rates as shown in figure 3. The sex distribution of the cases showed that male (31) and female(30) residents of the village were equally affected. Of the five villages in the town council, Kyarukara was the most affected (attack rate/1000 (AR) =20 compared to Kiganda (AR=0.67) and Top hill (AR=0.36).

The primary case-person was a fisherman who between spent 15th and 16th June 2016 fishing on the lake. On 16th he developed acute diarrhoea and came ashore on 16th June 2016. He reported that he defecated near the fenced Water-Collection Site after returning. It is highly likely that he defecated into the fenced area.

We hypothesized that the water from the caged collection site caused this outbreak by interviewing 10 random case-persons .

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We specifically interviewed study participants about their food **and water history during the two days of most likely exposure.**

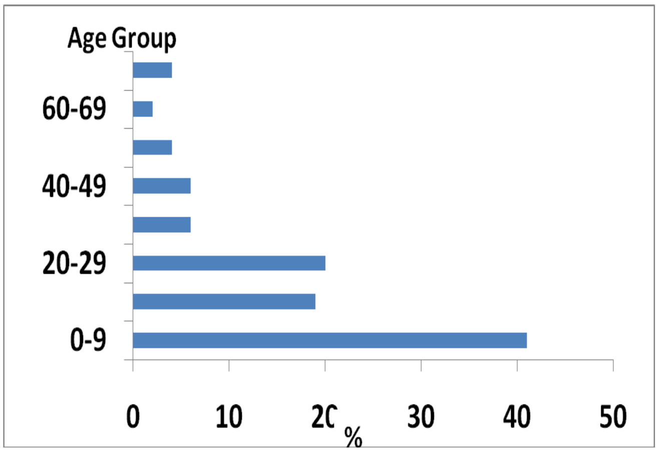

Figure 3: Distribution of cases by age group in Katwe Kabatooro Town Council during the cholera outbreak in June 2015 (Age specific Population missing)

We found that;

There had been no social gatherings between 15-17 June 2016 where people could have shared food or drink.

9 of the 10 case-persons reported that they usually collected water from a fenced water-collection site on the lakeshore and none of the 10 case-patients treated or boiled their drinking water.

Piped water supply in the town council broke down 8 months prior to this outbreak and people had resorted to spring water which is far off and expensive.

Food or water were possible sources in this point source outbreak. We specifically interviewed study participants about their food and water history during the two days of most likely exposure.

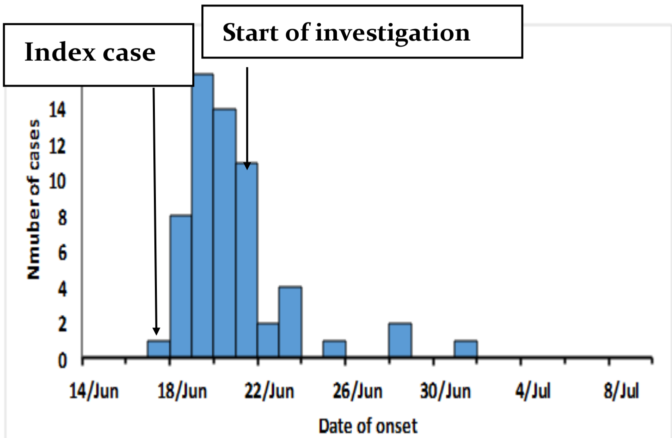

Figure 2: Epidemic curve, showing point source epidemic that occurred in Katwe Kabatooro town council in June 2015.

Case control study findings: From the case-control study, 95% of case-persons, compared to 67% of the control-persons, usually collected their drinking water from the Kyarukara caged water collection site (ORM-H 9.3, 95% confidence Interval CI: 2.1-39).

Laboratory findings: Of the samples tested, 19 Rapid Diagnostic Tests (RDTs) were positive while 8 tested positive on stool culture.

Environmental findings: It was noted that village in the town council and observed that every village had a fenced water collection site which was constructed in order to protect the community member fetching water from crocodiles and hippopotamus as they draw water from the river. Kyarukara village had a very latrine coverage (below 40%) with evidence of open defecation observed.

Discussion: The study showed that that drinking unsafe water (not boiled, treated or filtered) from Kyarukara fenced water collection site were much more likely to get infected. The population had resorted to the free unsafe lake water after main piped water system had broken down 8months prior to this outbreak.

Other alternative sources of drinking water were far off and much more costly. It should be noted that this outbreak occurred amidst an ongoing cholera outbreak, serotype Inaba, lasting 3 months and that had affected more than 80 other villages in Kasese District . This may explain the source of the outbreak. The affected community mainly depends on fishing and salt mining which subjects it to a lot of movement and interaction with other people during trade. Like several other cholera outbreaks, this outbreak was caused by contamination of drinking water[3, 4]. I

t is possible that the primary case-person could have actually defecated into the fenced area and contaminated the water. Community members and local leaders also reported that the initial cases washed their clothes including soiled bed linen near the cage in Kyarukara. These clothes were not disinfected before washing and could have further contaminated the cage water.

Conclusions and recommendations: This was a point-source cholera outbreak was caused by drinking water contaminated with feaces from a fenced water collection site at Kyarukara village. At our recommendations, the town council administration rigorously disinfected all patients' faeces at the cholera treatment center, fixed the tap-water system which had been dysfunctional, provided water treatment tablets, and issued water-boiling advisory. The outbreak stopped one week afterwards .

An evaluation of the Acute Flaccid Paralysis surveillance system, Northern Uganda, 2012-2015

Steven Ndugwa Kabwama, Fred Nsubuga, Alex Riolexus Ario

Public Health Fellowship Program

On 24th November 2014, two cases of circulating vaccine-derived polio were identified in South Sudan bordering Uganda to the North. We conducted a surveillance system evaluation to assess the completeness and timeliness of AFP reporting; sample collection, transportation, testing, and feedback and timeliness and quality of response. We defined an AFP case as sudden onset of weakness and floppiness of any limb in a child under 15 years of age or paralysis of a person of any age in whom polio is suspected. We found cases by reviewing health facility records from 2012 to 2015. We also cross referenced the cases analyzed by the laboratory with those found in the health records. Of 95 AFP case investigated, 31/61 (51%) were females, 36/95 (38%) of the cases were from Yumbe district and 84/95 (88%) had received at ≥3 poliomyelitis vaccine doses. In 2015, all districts but Kitgum had annualized non-Poliomyelitis AFP rates ≥1/100,000 children <15 years. In all the districts but Lamwo and Moyo, all samples were received at the lab within 3 days of being sent. None of the forms were filled for date results are sent from the lab to EPI, date of 60-day follow up and findings at 60-day follow up. The AFP surveillance system was optimal in most of the districts over the years as most targets were met by each district. However there is reluctance to complete AFP investigations. The epidemiology and surveillance division should stress to surveillance focal persons the importance of completing an AFP case investigation by following up cases after 60 days.

Introduction: On 24th November 2014, two cases of circulating vaccine-derived poliomyelitis were identified in South Sudan bordering Uganda to the north. The strains were isolated from two acute flaccid paralysis (AFP) cases. Poliomyelitis is an infectious disease, highly communicable and infected persons can spread the disease for up to six weeks.

The last poliomyelitis case in Uganda was in 1996 and Uganda was declared poliomyelitis-free in 2006. However there was WPV importation from South Sudan 2009 and from Kenya in 2010 and 2011. We therefore need to assess the effectiveness of the AFP surveillance system in the districts bordering South Sudan in responding to the imminent threat of poliomyelitis. The AFP surveillance system should entail investigation of all AFP cases within 48h of paralysis onset followed by collection of two adequate stool samples within 14 days of onset. The two stool samples should be received at a WHO accredited lab within three days of being sent and results sent within 28 days of being received. The investigation is completed by following up the cases investigated 60 days after initial investigation.

Methods: We defined an AFP case as sudden onset of weakness and floppiness of any limb in a child <15 years or paralysis of a person of any age in whom poliomyelitis is suspected. We found cases by AFP case investigation forms from 2012 to 2015. We also cross referenced the cases analyzed by the laboratory with those found in the records. The districts involved were Amuru, Moyo, Kitgum, Lamwo, Adjumani, Koboko and Yumbe. We analyzed the data to show surveillance performance indicators such as annualized non-poliomyelitis AFP rate /100 000 children <15 years, percentage of AFP cases with two adequate stool specimens collected 24-48 hours apart and <=14 days after onset, percentage of specimens arriving at a WHO-accredited laboratory within three days of being sent and percentage of specimens for which laboratory results sent within 28 days of receipt of specimens. These are WHO standard indicators and have been used in evaluations elsewhere (1, 2).

Results: Between 2012 – 2015, 95 AFP cases were investigated of which, 31/61 (51%) were females and 36/95 (38%) were from Yumbe district. Sixty four (82%) of all cases were negative for all poliomyelitis, 14 (18%) were determined to be non-poliomyelitis enterovirus while 84/95 (88%) of cases had received at least 3 poliomyelitis vaccine doses. In 2012, Adjumani and Moyo districts had an annualized non-Poliomyelitis AFP rate less than 1 per 100,000 children <15 years (Table 1).

In 2015, all districts but Kitgum had annualized non-Poliomyelitis AFP rates greater than 1 per 100,000 children < 15 years. Less than half of the forms were filled for the date of start of investigation 46 (48%), the condition of stool specimens 3 (3.2%) and the date specimens are sent to the lab 35 (37%). For three entries: date results are sent from the lab to EPI, date of 60-day follow up and findings at 60-day follow up, none of the forms were filled.

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In Koboko 2 (25%), Lamwo 1 (17%) and Moyo 3 (43%) districts, less than half of the suspected AFP cases were investigated within 48 hours. In all the districts but Lamwo and Moyo, all samples were received at the lab within 3 days of being sent.

Discussion: The evaluation revealed that 88% of cases had received at least 3 poliomyelitis vaccine doses. Poliomyelitis immunization coverage is a critical indicator of poliomyelitis prevention efforts. The rationale is that if a sufficient number of people are vaccinated, then transmission can be interrupted and outbreaks can be prevented from occurring. In northern Nigeria between 2003 and 2004, there was a suspension of all immunization activities because the locals rumoured a link between the immunization and infertility and the human immunodeficiency virus (3). The drop in immunization coverage created a gap in the herd immunity that was insufficient to interrupt transmission which led to several poliomyelitis outbreaks (4). Nigeria has in fact remained on the list of vulnerable countries at risk of importation of poliomyelitis (5). The poliomyelitis endgame requires that every last child is fully vaccinated against poliomyelitis. Routine immunization in these districts should be fortified with house to house and extensive house to house and child to child mop-up immunization campaigns of all children <5 years to ensure 100% immunization coverage.

Another indicator of the efficiency of poliomyelitis surveillance is the annualized non-polio AFP rate of >1 /100,000 children <15. It refers to the incidence of AFP due to illnesses other than polio. In 2012, Adjumani and Moyo districts had an annualized non-Poliomyelitis AFP rate less than 1/100,000 children under 15 years. By 2015, all districts but Kitgum had annualized non-Poliomyelitis AFP rates ≥1/100,000 children <15 years.

This implies that there has been a steady increase in the effectiveness poliomyelitis surveillance in the districts over the years.

In this evaluation, none of the forms were filled for date of 60-day follow up and findings at 60-day follow up. This implies that while district surveillance focal persons make an effort to investigate AFP cases, there is reluctance to follow up the cases after collection and delivery of stool specimens at the lab. A distinguishing feature of paralytic poliomyelitis is that an infected person remains a carrier for several weeks (6) and paralysis could persist even after 60 days (7). The reluctance of surveillance personnel in following up cases after 60 days might be because they don't see the need after they receive negative results from the lab. However the AFP cases could indicate outbreaks of paralytic neurological illnesses (such as Guillain-Barre syndrome, transverse myelitis, or tumors) among children <15 years (8) in those districts.

Koboko, Lamwo and Moyo performed poorly when it came to timely investigation of the AFP cases. In Lamwo and Moyo, most of the stool specimens were received at the lab after more than 3 days of being sent. On the roadmap leading to the eradication of poliomyelitis in the Americas, from 1992 until eradication, ≥80% of AFP cases were investigated within 48hours of notification (9). Also, the proportion of with adequate stool specimens collected gradually increased and consequently the number of wild poliomyelitis viruses reduced. The Ministry of Health should lobby for resources to be given to surveillance focal persons on delivery of stool samples that will ensure that AFP cases are investigated, the samples collected and received on time at the lab.

Conclusion and recommendations: The AFP surveillance system was optimal in most of the districts over the years as most targets were met by each district. However there is a reluctance to follow up investigated cases. The epidemiology and surveillance division should stress to district surveillance focal persons the importance of completing an AFP case investigation by following up cases after 60 days.

Table 1: Annualized non-Poliomyelitis AFP rates in 7 Districts bordering South Sudan in Northern Uganda 2012-2015

	2012			2013			2014			2015		
District	N	Popn	AR	N	Popn	AR	N	Popn	AR	N	Popn	AR
Adjumani	1	185645	**0.54**	2	197452	1.0	2	115010	1.7	2	115991	1.7
Amuru	2	88327	2.3	3	90698	3.3	1	94115	1.1	4	96281	4.2
Kitgum	2	122413	1.6	1	127254	**0.79**	1	100782	**0.99**	1	102060	**0.98**
Koboko	4	117029	3.4	3	124389	2.4	2	102833	1.9	5	106210	4.7
Lamwo	2	84622	2.4	3	87981	3.4	4	66221	6.0	3	66838	4.5
Moyo	1	203775	**0.49**	1	219682	**0.46**	6	67920	8.8	3	69160	4.3
Yumbe	7	269477	2.6	9	291213	3.1	11	239878	4.6	8	250903	3.2

Cholera outbreak caused by drinking lake water contaminated by sewage in Kaiso, Hoima district.

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This article presents a well investigated cholera outbreak which was controlled following recommendations based on field epidemiological evidence. In October 2015, a cholera outbreak was reported in Kaiso fishing village in Hoima district. The district responded by conducting mass sensitization and setting up a cholera treatment center in the village. The response reduced the number of cases, but the outbreak persisted until thorough outbreak investigation was done by field epidemiologists to identify the source of transmission. From a case control study and environmental assessment, drinking lake water contaminated by human feces from a gully channel after heavy rainfall ensued a point source outbreak. Following our evidence based epidemiological recommendations treatment of drinking water was done in households to stop the outbreak. We also recommended fixing of the piped water system which had broken down and construction of pit latrines as measures to prevent future cholera outbreaks in Kaiso

Introduction: Cholera is an epidemic potential diarrheal disease caused by gram negative bacteria, Vibrio cholerae. The pathogen produces a toxin which causes severe loss of water in patients [1, 2]. . Each year cholera outbreaks occur in Uganda with annual average of 11,000 cases and 60-182 deaths. Rural areas of Uganda particularly areas neighboring the Democratic Republic of Congo are prone to cholera outbreaks because of interaction of people from different traditional settings with diverse hygiene and sanitation practices [3]. Lake side areas have been described to be hot spots of cholera epidemics during heavy rainfall compared to others areas. Generic public health actions are frequently used in cholera epidemic responses without detailed field investigations to address the source and mode of transmission. This could partly explain why cholera outbreaks have occurred repeatedly in the same areas. In this article, we report a case where field investigation of a cholera outbreak generated evidence based recommendations that promptly controlled the outbreak.

On 12th October2015, the District Health Officer Hoima district reported an outbreak of cholera in Kaiso fishing village, located on the shoreline of Lake Albert. The disease had killed 2 people and many others. The district and the Ministry of Health responded by setting up a cholera treatment center (CTC) in the village and sensitizing the community. Despite three weeks of the response, the number of cholera cases continued to increase till over 120 cases were reported and the outbreak persisted. We conducted an epidemiological investigation to identify the source and mode of transmission in order to recommend evidence-based interventions to stop the outbreak.

Methods: Kaiso village is located in Buseruka Sub-county on the shoreline of Lake Albert, Hoima district. The village is made up of three zones, Fichama, Songa-Bakobya and Songa-Lendu. The major tribal groups are the Bagegere, Bakobya, Alur, Banyoro, Bagungu and Congolese tribes. The village has estimated population of 9000 people. Songa-Lendu has a population of 6500, Songa-Bakobya 2000 and Fichama 500.The major economic activities are fishing and casual businesses. The village settlement has a sloping landscape extending from the escarpment of the western rift valley to the shoreline of Lake Albert. Latrine coverage in the village is low (10%), hence open defecation is a common practice.

We defined a suspected case as onset of acute watery diarrhoea in a resident of Kaiso Village from 1st October 2015 onward; a confirmed case was a suspected case with Vibrio cholerae isolated from stool. We line listed a total of 122 cases from the Cholera treatment center and community. We conducted a descriptive analysis of the updated line list to characterize the outbreak by person, place and time. Out of the 122 cases line listed, we obtained information from 80 who were present in the village by then. We obtained rainfall data from Kabwoya wildlife reserve weather station Located 2 km from Kaiso village.

From findings of descriptive epidemiology, we generated a hypothesis that drinking untreated lake water was the source of the outbreak. We carried out a case control study in which we interviewed 60 cases (aged 5 years and above) and 124 village controls using a structured questionnaire to test our hypothesis. Controls were residents of Kaiso village without acute watery diarrhoea within the same period of our case definition. We asked cases and controls questions on the sources of drinking water and history of boiling or treatment of water prior to the outbreak .

We inspected shore line water collection sites in the three zones of the village to assess possible sources of contamination. We also observed practices of human fecal disposal in the village, alternative sources of water and latrine coverage.

Results: By 2nd November 2015 22 cholera cases had been registered with 2 deaths (CFR= 1.6%). The epicurve showed a point source epidemic which started following heavy rainfall and reached its peak on 13th October (Figure 1).

One death occurred on 2nd and another on 10th October. Heavy rainfall washed feces from open defecation area in a gully channel during this period resulting into a point source outbreak in the community. On 12th October a cholera treatment center was set up in the village. On 14th October chlorine was distributed to households to treat drinking water after which a decline in the number of cases was noted.

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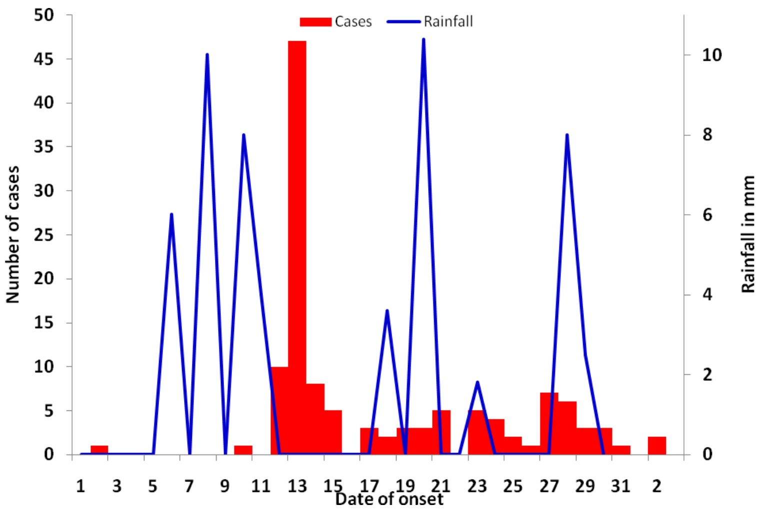
Fig1, A point source cholera epidemic in Kaiso village following h heavy rainfall October-November 2015

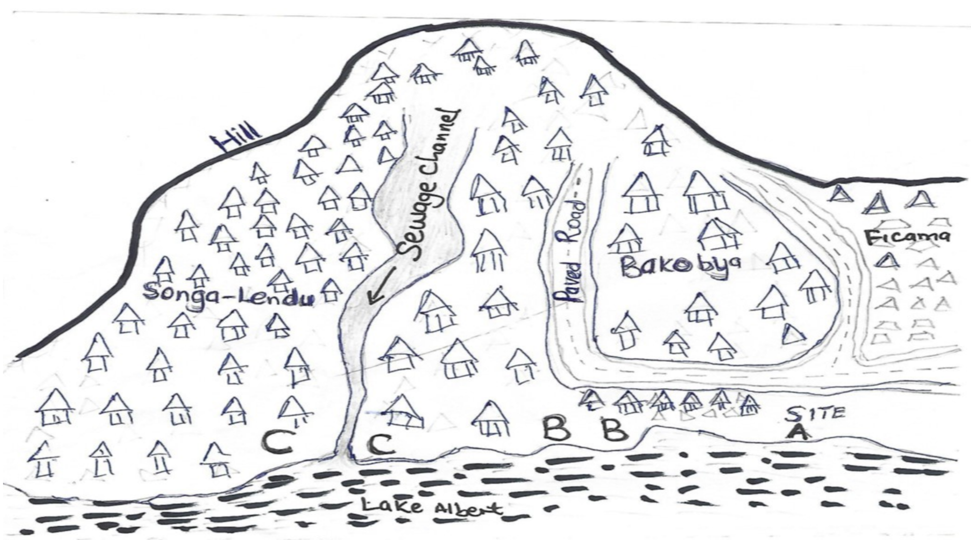


Of the 3 villages, Songa-Bakobya was the most affected (attack rate = 18/1000) compared to 4/1000 in Fichama.

Case control study Findings: People who collected water from Songa-Lendu (Site C) were seven times more likely to get cholera compared to those who collected water from the Lake rescue site A. Drinking un-boiled water was associated with cholera. People who drank untreated water were more likely to get cholera compared to those who drank boiled water (Table 3).These findings supported the hypothesis that drinking contaminated lakeshore water was the mode of the cholera transmission in the outbreak.

Environmental assessment findings: We found three major water collection sites (A,B, &C) along the shoreline as shown in figure 2. Site A (Lake rescue) is protected from water runoff contaminants by a paved road which lies parallel to the shoreline as illustrated in figure 2.

Fig2, A sketch map of Kaiso village showing water collection points and a sewage



People from Ficama zone collected water from site A. Site B was partially protected by a paved portion of the road while site C was a point where feces from open defecation area was discharged into the lake through a gully channel. This was a water collection site for people of Songa-Lendu and part of Songa-Bakobya. Open defecation was common along the gully channel because of lack of pit latrines in most households. The piped water system in the village had been vandalized six months earlier forcing the community to depend on the Lake as the primary source of water.

Discussion: Our investigation found a point source outbreak which occurred after rainfall washed human feces from a hillside open defecation area into the Lake shore water in Kaiso village. Attack rate was higher in Songa-Lendu and Bakobya villages in Fichama zone. Cholera transmission occurred through drinking untreated Lake water.

Table 2: Association between water collection sites and cholera

Exposure	% cases exposed (n=61)	% controls exposed (n=126)	OR_{M-H} (95% CI)
Songa-Lendu (Site C)	69	33	6.7 (2.5-17)
Songa-Bakobya (Site B)	21	37	1.8 (0.64-5.3)
Lake-Rescue (Site A)	10	30	Ref

Higher cholera attack rates in Songa-Lendu and Songa-Bakobya were due to proximity of the villages to the contaminated water collection site. Most people from these two zones collected their water for domestic use from site C. People living in Ficama zone collected water from the lake rescue site (A) which is close to them. The oil exploration company constructed a paved road between the residential area of the village zone and the shoreline. This protects the site from contamination by materials carried by erosion from residential and open defecation areas hence the lower attack rate in Ficama than the other two zones. Both children and adults were affected in this this outbreak.

Conclusion: This cholera outbreak was caused by drinking lakeshore water contaminated by human faeces washed down a gully channel after heavy rainfall.

Recommendations: We recommended provision of safe drinking water through; provision of water treatment tablets and boiling drinking water; repairing and protecting the vandalized piped water system by district authorities; and safe disposal of human waste

Table 3, Risk factors associated with cholera, Kaiso, Hoima.

Exposure	% cases exposed	% controls exposed (n=126)	OR_{M-H} (95% Fishers exact CI)
Drinking un - boiled water	100	97	∞ (1.0-∞)
Drinking boiled water	0	7	Ref