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Dear Reader,

Welcome to the fifth volume of Issue 2 of the Uganda National Institute of Public Health (UNIPH) Quarterly Epidemiological Bulletin.

This bulletin aims to inform the district, national, and global stakeholders on disease outbreak investigations, public health surveillance and interventions undertaken in detecting, preventing and responding to public health events in the country.

In this issue, we present updates on Crimean-Congo Haemorrhagic Fever outbreak among livestock workers in Central Uganda; Distribution of tetanus in Uganda between 2012 and 2016; Analysis of Surveillance data to determine the distribution of Human Brucellosis in Uganda; Increasing cases of multidrug resistant tuberculosis associated with poor adherence to first-line anti-tuberculosis treatment in West Nile region of Uganda and evaluation of the surveillance system in Adjumani District Refugee Settlement also features in this issue. Three policy briefs have also featured in this issue; Improve adherence to malaria test results to achieve the test and treat policy, policy and programmatic implications to tuberculosis control in schools following a tuberculosis outbreak in a secondary school in Mukono District and routine mass vaccination of livestock to curb cutaneous anthrax outbreaks in Arua district of Uganda.

In case you would like to access original references used in this issue, feel free to contact us at: patricia.eyu@musph.ac.ug OR **dkadobera@musph.ac.ug**

We will appreciate any feedback regarding the content and general outlook of this issue and look forward to hearing from you. We hope this will be both an informative and enjoyable reading to you. Wishing you a happy new year.

Thank You

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Inside this issue:

PHFP conducts the 3rd Uganda National Field Epidemiology Conference (UNFEC)

By Patricia Eyu and Freda Loy Aceng

The 3rd UNFEC was held on 14 November, 2017 at Imperial Royale Hotel. The theme was "All round Approach to Epidemic Detection and Response." This conference brought together several dignitaries from the government, academia and international guests. The guest of honor was the Hon. Minister of Health Dr. Jane Ruth Aceng. The conference was organized by the Uganda Public Health Fellowship Program which has enrolled 3 cohorts of 31 Fellows since its inception in 2015. At total of 35 presentations were made, 29 of which were by fellows about outbreak investigations, epidemiologic studies, analysis of surveillance data and evaluation of surveillance systems. The conference was opened to other authors to present their work which enabled 6 Public Health Officers from the School of Public Health to present their work. This platform enabled fellows to expose the different public health challenges facing the nation and propose evidence based recommendations to policy makers. This was also a platform for national and international experts to discuss pertinent issues arising and offer solutions. There were a number of notifiable disease investigations presented such as Anthrax, Crimean-Congo Hemorrhagic Fever, Marburg Viral Disease and Multi-Drug Resistant Tuberculosis among others.

The morning plenary sessions consisted of Global Health Security issues, Foodborne Diseases; Refugee Health and Surveillance. The afternoon programme was composed of breakout sessions and included presentations on Airborne Diseases, Malaria, Waterborne Diseases, Zoonotic diseases/ One Health, HIV/AIDS and, Maternal Child Health and Cancers. Notably all the guests received a comprehensive abstract book which is a compilation of all abstracts presented by fellows at national, regional and international conferences from 2015 - 2017. The abstracts are majorly composed of the key areas where fellows gain competencies which are public health emergencies, analysis of surveillance data and evaluation of public health surveillance systems, cost analysis of outbreaks, quality improvement science amongst others.

Seated: Dr. Bao-Ping Zhu, Dr. Alex R. Ario, Prof. Rhoda Wanyenze, Dr. Lisa Nelson, Dr. Julie Harris and Dr. Jaco Homsy. Standing: Fellows (including upcoming Cohort 2018 Fellows) pose for a picture at the end of the conference

Upcoming Events

The 1st International Non-Communicable Diseases Symposium

Makerere University College of Health Sciences is organising the first International NCD symposium in Kampala (MakNCD Symposium). The theme of the Conference is "Building Momentum to address the growing epidemic of Non-Communicable Diseases in Africa" . The conference is scheduled to take place between 12th to 15th February 2018 at Speke Resort and Conference Centre Munyonyo Kampala.

The 4th Cohort of 12 fellows enrolment

Cohort 2018 field epidemiology fellows enrol for their 2 year program on 15th January 2018. They will start with attending a 6 weeks didactic training before they are placed at their host sites at priority programs at Ministry of Health.

Cohort 2016 field epidemiology fellows graduation

The 2nd cohort of field epidemiology fellows of the Uganda Public Health Fellowship program will graduate on the 24th January 2018. A total of 9 fellows have successfully completed the 2 year training program in field epidemiology and will graduate at a colourful ceremony at Imperial Royale Hotel in Kampala.

3rd UK East Africa Health Improvement and Investment Summit

The 3rd UK East Africa Health Improvement and Investment Summit will be held at Speke Resort Munyonyo Kampala on 22 - 23 March 2018.

Crimean-Congo Hemorrhagic Fever Outbreak among Livestock Workers, Central Uganda - Aug-Sep 2017

Susan Kizito [1], Paul Okello[1], Benon Kwesiga [1], Luke Nyakarahuka [2], Alex Riolexus Ario [1]

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Summary: *On №th August , №º3 Uganda Ministry of Health was notified of two RT- PCR-confirmed Crimean-Congo Hemorrhagic Fever (CCHF) cases from two district hospitals in Central Uganda. Following the alert, a multi-disciplinary National Rapid Response Team (NRRT) responded with the objective of determining the scope, risk factors for the outbreak and recommending evidence based control measures. The case fatality rate was 36.4% and Nakaseke District was the most affected. We also conducted a frequency-matched case-control study which showed that cases had bites/contact with ticks.*

Introduction: CCHF is a hazardous viral hemorrhagic disease of epidemic potential (1,2). Today, it is the most widely distributed tick-borne viral disease mainly affecting humans in Africa, Asia and Europe (3,4). CCHF is enzooticaly and epizootically maintained in the environment and transmitted through tick bites or contact with infected animal tissues (1,5). Sick persons present with sudden onset of high grade fever, body weakness, yellowing of eyes. Later on cases present with bleeding symptoms although most go undiagnosed. Up to 40% of infected people die from the disease (6). The spread of disease is believed to be favored by recent global climatic changes like warmer temperatures, grassland vegetation, livestock trade, and movement of migratory birds during summer periods (5,7).

On August 20, 2017 the Uganda Virus Research Institute (UVRI) notified the Ministry of Health (MoH) of two confirmed Viral Hemorrhagic Fever (VHF) cases from two district hospitals in Central Uganda. Both cases presented with high grade fevers and uncontrollable bleeding. Blood samples from the suspected cases were confirmed positive for Crimean – Congo Hemorrhagic Fever by real-time reverse transcriptase - Polymerase Chain Reaction (RT- PCR) after excluding Ebola, Marburg, RVF and Sosuga hemorrhagic fevers. The two confirmed case-persons were working in two of central Uganda's cattle-producing districts - Nakaseke and Kyankwanzi. Following the alert, a multi-disciplinary National Rapid Response Team (NRRT) immediately responded with the objective of determining the scope, risk factors for the outbreak and recommending evidence based control measures.

Methods: We defined a probable case-person as sudden onset of fever for ≥3 days, with spontaneous bleeding or bruising or clinical laboratory evidence of pancytopenia (all unexplained by other causes) in a resident of districts affected by the outbreak from July to August 2017. A confirmed case was a probable case with confirmation of CCHF by RT-PCR. We identified cases mainly through the review of medical records at district hospitals and active case finding with assistance from local leaders and village health team members. We visited the farms on which the confirmed cases worked and collected ticks and blood samples from some of the animals. We conducted an environmental assessment and carried out a matched-case-control study among asymptomatic male case-person neighbors of similar age-group.

Results

Person distribution: We line-listed 7 adult case-persons, five of which met the probable case definition while two were confirmed. All case-persons (100%) were male. The median age was 26 years, and age range 15 to 87 years. Two probable case-persons died, (Case Fatality Rate = 29%). Clinical presentation of symptoms were: fever (100%), general body weakness (86%), spontaneous bleeding (86%) among case-persons. The high body temperatures were persistent despite use of anti-malarial treatment, antibiotics or anti-pyretic medication. These key symptoms were consistent with Crimean-Congo Hemorrhagic Fever.

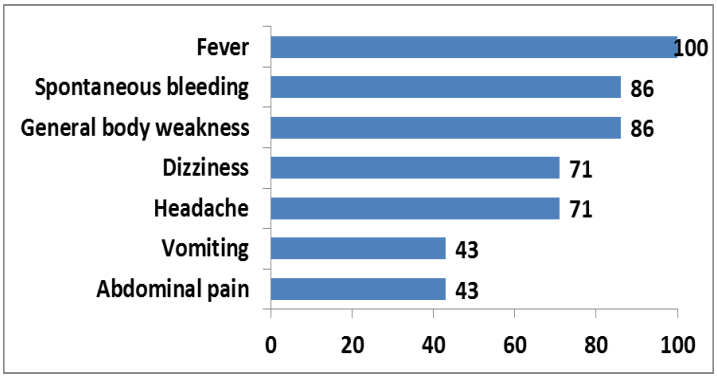

Figure 1: Distribution of symptoms among case-persons

Place distribution: Case-persons were from three districts: two from Kyankwanzi, two from Luwero and three from Nakaseke districts. The spot map shows the place distribution of cases in relation to the location of hospitals were treatment was sought.

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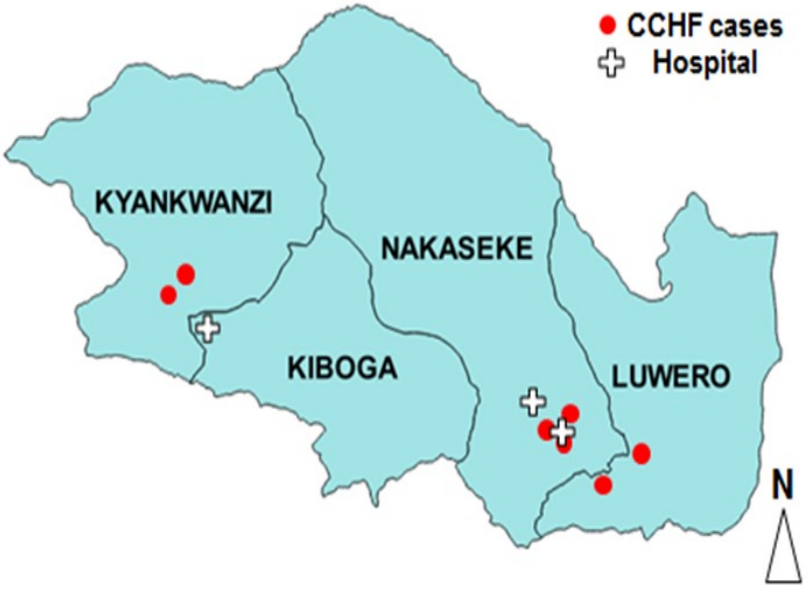

Figure 2: Distribution of CCHF cases and location of hospitals in affected districts

The attack rate (AR) per district shows that Nakaseke had the highest attack rate, (AR=2.8/100,000), followed by Kyankwanzi (AR=1.8/100,000), and Luwero (AR= 0.9/100,000) (Figure 3).

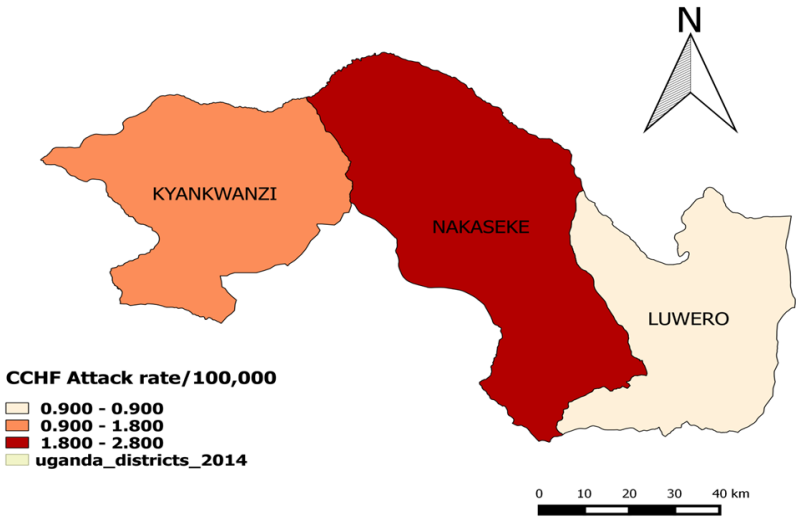

Figure 3: CCHF attack rate/100,000 case-persons in three affected districts

Laboratory analysis of animal specimens: An analysis of blood samples collected from livestock animals on farms were confirmed case-persons worked showed 9 (60%) of blood samples from cattle and 2 (29%) of goat blood samples were CCHF sero-positive.

Case-Control Study: We conducted a case-control study in which case-persons were frequency-matched to controls by gender, age-group and neighborhood. Having experienced a tick bite or having squashed ticks with bare hands was strongly associated with acquiring CCHF (OR_{M-H}=11, 95% CI=1.1-112). The other exposure considered were contact with livestock in the last two weeks (OR = 2, 95%CI=0.18-105), having milked livestock with bare hands (OR =0.62, 95%CI=0.10 -3.8), contact with raw wild animals meat (OR = 1.39, 95%CI=0.02-15). However, these exposures were not statistically significant.

Discussion: The CCHF outbreak identified in three cattle-corridor districts of Kyankwanzi, Luwero and Nakaseke was most likely due to tick bites. The magnitude of the outbreak was most felt in Nakaseke district although the extent of the outbreak could have been under estimated. Sporadic cases of CCHF will continue to arise because of the favorable multiplication of the virus transovarially and transtadially (8). The virus multiplies in livestock and livestock-workers continue to get exposed although not many are seen to be reported. This could be due to limited review of medical records, insufficient clinical history data or inability to carry out diagnostic tests. There were no reported secondary cases among hospital staff or care takers despite the nature of disease having a high transmission rate. This could be due to Uganda's growing capacity to manage and control viral haemorrhagic fevers like CCHF, Ebola and Marburg through surveillance, work-force and laboratory capacities as well as the existence of the Emergency Operations Centre to rapidly prevent, detect, respond and control outbreaks t the source.

Conclusion: The CCHF outbreak was a fatal zoonotic viral haemorrhagic disease transmitted by ticks in the 3 districts of central Uganda. Spraying of livestock with pesticides to kill ticks will help to control transmission of disease.

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Policy and Programmatic Implications to Tuberculosis control in Schools following a Tuberculosis outbreak in a Secondary School in Mukono District, Oct. 2017

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Summary: On 5 October 2017, the Ministry of Health National TB and Leprosy Program was notified of a possible tuberculosis (TB) outbreak in a boarding secondary school in Mukono District. Investigations revealed several students with TB disease in the school. Non-isolation of infectious students, poor ventilation, and congestion in residential dormitories and lack of treatment could have propagated this outbreak. We recommended improvement in TB infection control in the school, improved ventilation, reduced congestion, identification and isolation of infectious students and offering treatment support to individuals with TB in school.

Introduction: TB remains a major public health problem in Uganda and the country is considered by the World Health Organization among the 30 high burden TB/HIV countries [1]. A national TB prevalence survey conducted in 2015/16 revealed TB prevalence of 253/100000 and incidence of 234/100000 [2] compared to previously estimated TB prevalence of 159/100000 [3]. With a TB notification of 43413 in 2016, the country missed about half of the estimated incident TB cases [1]. TB case finding remains a major challenge in the country despite efforts by Ministry of Health and partners; case finding is even harder among children and adolescents age 15 years and below. The country notifies only about 8% of all TB as children as opposed to the estimated 15-20%. Evidence from the national TB prevalence survey identified a TB notification to prevalence ratio of 2.0 among individuals aged 15-24, implying that for every one individual diagnosed with TB in that age group, two are missed.

On 5 October 2017; a rumor about a tuberculosis outbreak in a secondary school in Mukono District was received by Ministry of Health National TB and Leprosy Program (NTLP), via the NTLP' whatsApp platform. Initial investigations by Mukono District Health Team (DHT) revealed that in a span of one year, the school had recorded 4 students with confirmed TB. Tuberculosis is an infectious disease spread from one person to another through droplet transmission from an infected individual via the respiratory route.

Approaches and Results: We investigated this TB outbreak to determine the scope, risk factors for transmission and to recommend evidence-based interventions. We defined a suspected TB case as onset of fever or night sweats, plus cough, chest pain, fatigue or weight loss in a School X student. A probable case was a suspected case with chest X-rays (CXR) suggestive of TB or diagnosed clinically. A confirmed case was a suspected or probable case testing positive by Xpert MTB/RIF. We found cases by reviewing medical records at the school dispensary, Mukono HC IV, medical records kept by students and performed CXR and screening among close contacts (i.e., sharing dormitories or in the same grade) of the initially-reported confirmed cases for signs and symptoms. We evaluated risk factors for developing TB disease, including dormitory crowding and ventilation.

Of the 224 close contacts investigated, We found 30 cases (10 confirmed, 20 probable) (attack rate [AR]=13%(30/224). The primary case-student diagnosed mid-2015 started on 1st line TB treatment but was lost to follow-up two months later. Neither he nor subsequent case-students were ever isolated. Cases at School X occurred among Senior 4 (23/145, AR=16%) and Senior 5 students (7/79, AR=8.9%). Males (AR=20%) were more affected than females (AR=5.7%). Among CXR performed, 13% (25/191) were suggestive of TB. In dormitories, average per-student living space was 3.1m^2 (Recommended is $> 3.5m^2$). The window-to-living-space area ratio was 4.5% (Recommended is20%).

Currently efforts by the Ministry of Health and partners towards TB control in congregate settings have focused on prisons and urban slums, where dedicated projects exist. TB control in schools and other institutions of higher learning has not had much attention yet evidence shows that TB exists in schools and other institutions.

Policy and programmatic implications

There is an urgent need to recognize TB in schools and other institutions as a major challenge that requires urgent solutions. Policy makers can tackle TB in schools by:

1. Strengthening of TB surveillance among children of school going-age, through introduction of TB control interventions in school health programs.
2. Creation of a technical working group for TB control in schools with membership from Ministry of Health, Ministry of Education

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and Sports and decentralized governance representation among others

3. Adherence to building standards (recommended window to floor area), routine inspection of students' residential dormitories; and supporting schools to implement recommendations.

4. Demand creation for TB prevention and control among students, student leaders and teachers.

5. Creation of treatment support systems for students with chronic diseases including TB and HIV.

6. Strengthening of routine pre-school medical examinations and inclusion of a TB assessment component. An annual chest x-ray is recommended.

7. Routine isolation of students with TB in schools.

8. Routine epidemiological investigation for every notified student with TB should be conducted and recommendations implemented.

9. There may be need to consider isoniazid preventive therapy for close contacts with TB infection in whom TB disease has been excluded.

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Analysis of Surveillance data to determine distribution of Human Brucellosis in Uganda, July 2015 to June 2017

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Summary: *Brucellosis is a common zoonosis in Uganda with a human seroprevalence of 17%. We analysed surveillance data reported from all levels of health facilities into the Health Management Information System (HMIS) to identify the populations at risk and evaluate geographical distribution of brucellosis in Uganda between July 2015 and June 2017. Monthly and annual district level aggregated data on brucellosis prevalence was obtained from HMIS for 112 districts. The prevalence of brucellosis was nearly twice as high among females (512/100,000) than among males (269/100,000). The age-group 60+ years (906/100,000) had a higher prevalence than other age groups. Northern Uganda had the highest prevalence (313/100,000) compared to Eastern (248/100,000), Central (278/100,000) and Western (228/100,000) regions. Kotido and Lyantonde districts had the highest prevalence of brucellosis over the years ranging between 350-1000/100,000 persons. We recommend increasing sensitisation about the mode of transmission and how to prevent brucellosis transmission targeting females, elderly and districts with high prevalence.*

Introduction: Brucellosis is the most common bacterial zoonosis worldwide with more than 500 million estimated new cases each year. Brucellosis has major economic consequences due to time lost by patients from normal daily activities [5] and losses in animal production [6]. World Health Organisation (WHO) Global and Regional Disease Estimates done in 2015 showed that *Brucella* species resulted in 0.83 million illnesses with almost 333,000 chronic infections [7]. Possible risk factors for brucellosis include; consuming locally processed milk products, residing in rural areas, being elderly and being an agro pastoralist, among others [8, 9].

The Integrated Disease Surveillance and Response guidelines categorises the laboratory criteria for diagnosis of brucellosis into two; definitive (blood culture) and presumptive (*Brucella* total antibody titer or *Brucella* micro agglutination test) [10]. In Uganda, routine diagnosis of brucellosis in health facilities is mainly by serology using the Brucella Agglutination Test (BAT). There is scanty information on national level prevalence of human brucellosis in Uganda, and yet all health facilities and district level prevalence is reported in the District Health Information System (DHIS2) every month. We therefore conducted an analysis of surveillance data from all levels of health facilities reported in the DHIS2 to identify the populations at risk and determine the geographical distribution of human brucellosis in Uganda between July 2015 and June 2017.

Methods: Monthly and annual district level aggregated data on brucellosis prevalence was obtained from the district health information system (DHIS2) of Uganda from 112 districts. Brucellosis episodes are reported by age group (<5 years, 5-59years and 60 years), sex (male and female), period, region and districts from July 2015 to date. Brucellosis data was extracted from the Health Management Information System form 105 Out Patient Department (HMIS 105 OPD) from 2521 health facilities. The abstracted data was cleaned and exported to Epi info version 7.2.0. The 2014 National Population and Housing Census data was extrapolated using an annual growth rate of 3.03% to carryout descriptive analysis on person, place and time characteristics. Prevalence was calculated per 100,000 persons and distribution of age and sex was carried out to describe the person characteristics. QGIS was used to map brucellosis in the districts of Uganda.

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Findings

Distribution of brucellosis by sex between July 2015 and June 2017

Brucellosis prevalence is nearly twice as high among females compared to males.

Sex	Cases	Population	Prevalence/100,000
Male	35,597	18,353,190	194
Female	69,557	18,905,034	367
Total	105,154	37,258,224	282

Table 1: Distribution of brucellosis by sex between July 2015 and June 2017

Distribution of brucellosis by age between July 2015 and June 2017

The prevalence of brucellosis increases with increase in age with children (<5 years) having the lowest prevalence at 55/100,000 and adults above 60 years with the highest prevalence of 889/100,000.

Age in years	Cases	Population	Prevalence/ 100,000
0 to 4	3,622	6,631,964	55
5 to 59	88,280	29,135,932	303
60+	13,252	1,490,329	889
Total	**105,154**	**37,258,225**	**282**

Table 2: Distribution of brucellosis by age between July 2015 and June 2017

Distribution of brucellosis by region between July 2015 and June 2017

The prevalence of brucellosis between July 2015 and June 2017 is highest in the Northern region of Uganda. Lyantonde () and Kotido () Districts had the highest prevalence of Brucellosis over the years .

Region	Cases	Population	Prevalence/ 100,000
Central	28,487	10,251,066	278
East	24,168	9,727,385	248
North	24,185	7,732,640	313
West	21,790	9,547,133	228

Table 3: Distribution of brucellosis by region between July 2015 and June 2017

Discussion: This analysis shows that females are almost three times more affected than males with human brucellosis. These findings contradict findings of a study carried out in Central Greece that showed that males had a higher incidence compared to females [11]. Also another cross sectional study carried out in Kiboga district of Uganda showed that the prevalence of brucellosis was higher among males compared to females [8]. Another cross sectional study carried out in Volta region of Ghana also showed a brucellosis prevalence of 88.9% in males [12]. The prevalence of brucellosis in our study could be higher in females compared to males because the data set is obtained from health facility records and it is known that women have better health

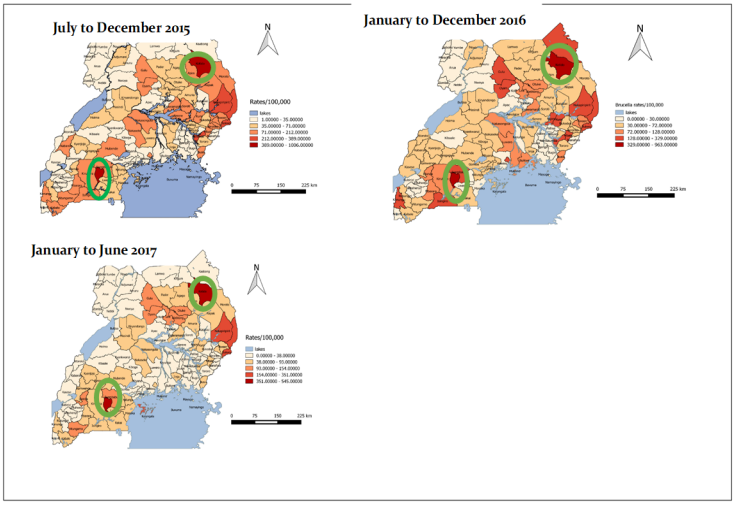

Figure 1: Distribution of brucellosis by district between July 2015 and June 2017

care seeking behaviour and could surely have higher reporting compared to males [13]. The findings of these three studies could also contradict our findings because they were carried out in cattle keeping communities which increase the risk in males since they are the ones involved in handling cattle.

This analysis also shows that persons aged 60years and above have a higher prevalence compared to persons aged 5-59years and 0-4years. This is consistent with a study carried out in Kiboga district in Uganda which showed an increased risk in the elderly above 60years [8]. These are in line with findings from another study in Bangladesh which showed an increasing risk among older persons [14]. The higher prevalence in the elderly could also be because of the traditional role of the elderly in cattle keeping in Ugandan communities.

Kotido and Lyantonde districts had the highest prevalence of brucellosis over the years. These are districts whose habitats are mainly cattle keepers. It is also known that Karimojong who also inhabit Kotido have cultural practices of consuming raw milk mixed with raw blood as a delicacy [15].

Conclusion and recommendations: The prevalence of brucellosis is higher among females compared to males. Elderly persons above 60years of age had a higher prevalence of brucellosis compared to younger people while Kotido and Lyantonde districts had the highest prevalence of brucellosis over the years. We recommended further studies to be conducted to identify risky behaviours for brucellosis among most affected groups and increased awareness about prevention of brucellosis transmission targeting females, elderly and districts with high prevalence.

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Increasing cases of Multidrug Resistant Tuberculosis associated with poor adherence to first-line anti-tuberculosis treatment: West Nile Region, 2013-2017

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Summary: *Multidrug resistant tuberculosis (MDR-TB) is infection with strains of Mycobacterium tuberculosis resistant to isoniazid and rifampicin. Compared to drug-susceptible tuberculosis, treatment of MDR-TB is a lengthy and expensive undertaking, and has a lower cure rate. It has been estimated that treatment of drug resistant tuberculosis takes up over 50% of the budget of national TB control programs. In July 2017, Medical Teams International (a Non-Governmental Organization) reported high cases of MDR-TB in Arua District with some among refugees. We set out to determine the scope of MDR-TB in West Nile Region. In Arua District specifically, we identified risk factors for MDR-TB and assessed capacity of health facilities and communities to prevent MDR-TB spread. Between 2013 and 2017, we identified 85 MDR-TB cases in West Nile of which 33 were from Arua District. 73% (62/85) were males while 19% (16/85) were refugees. In Arua, a case-control study among MDR-TB case-persons and TB patients (as controls) revealed that poor adherence to first line anti-TB drug regimen and positive HIV status were associated with the development of MDR-TB. We also found that infection prevention and control practices at the Hospital and in the community present a big risk for transmission of MDR-TB cases. We recommended adequate isolation of MDR-TB cases, emphasis on TB drug adherence and use of masks.*

Introduction: The emergence of multidrug resistant tuberculosis (MDR-TB) has attracted global concern. Treatment of MDR-TB is a lengthy and expensive undertaking, yet with only about 55% cure rate (1). MDR-TB is caused by *Mycobacterium tuberculosis* strains that are resistant to isoniazid and rifampicin. It may be acquired through inappropriate TB treatment or transmitted from person to person. A person with TB who does not adhere to first-line anti-TB treatment is at risk of MDR-TB. Additionally, MDR-TB infected persons may transmit the drug-resistant strain to uninfected persons through droplets. High risk groups for the development of MDR-TB include HIV-infected persons and patients exposed to TB treatment (2). Refugees may also be at risk for MDR-TB through crowded living conditions and poor medical supplies (3). Medical Teams International, an organization that works with refugees in Uganda, reported 14 confirmed cases of MDR-TB in Arua District, particularly among refugees. We set out to determine the scope of MDR-TB in West Nile, identify risk factors for development of MDR-TB in Arua District and assess the capacity of health facilities and the community to prevent development/spread of MDR-TB.

Methods: We defined a suspected MDR-TB case as a TB case who had been on first-line anti-TB treatment for at least 2 months. We defined a confirmed MDR-TB case as resistance to at least rifampicin and isoniazid confirmed by Gene-Xpert or molecular Drug Susceptibility Test (DST). We abstracted data from the TB initiation center at Arua Regional Referral Hospital (ARRH). We identified records of all MDR-TB patients resident in Arua District from 2013 to 2017 and conducted descriptive epidemiology. We generated and tested hypotheses using a case-control study. The ratio of cases to controls was 1:3. Controls were defined as TB cases on treatment for at least 2 months and had a negative Gene-Xpert result for resistance to rifampicin. We used structured questionnaires to assess the capacity of health facilities to diagnose and manage TB. Through observation, we assessed infection control and prevention practices in health facilities and community.

Results: Between 2013 and 2017, we identified 85 MDR-TB cases in West Nile of whom 33 were from Arua. 73% (62/85) were males while 19% (16/85) were refuges (Figure 1). Among Arua case-persons, we found that poor adherence to first-line TB treatment (OR-14.3 [95% CI: 4.6-44.7]) and positive HIV status (OR-2.4 [95% CI: 1.1-5.5]) were significantly associated with development of MDR-TB. Oluko sub-county had

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the highest proportion of MDR-TB cases (Figure 3). All health facilities assessed reported having stock-outs of essential anti-TB commodities while 89% (8/9) of facilities sampled were accredited to provide TB services and had a laboratory, 56% had at least one laboratory staff. Infection control and prevention practices in health facilities and community were poor. At Arua Regional Referral Hospital (ARRH), 11 MDR-TB inpatients exceeded the initial carrying capacity of 4. Therefore MDR-TB patients were transferred to the drug-susceptible TB ward increasing likelihood of spread of infection.

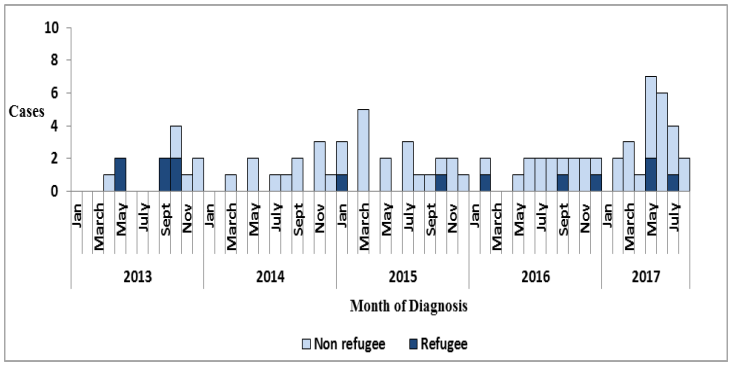

Figure 1: Distribution of MDR-TB cases by month of diagnosis in West Nile Region; 2013-2017

Figure 2: Map showing number of confirmed MDR-TB cases in Districts of West Nile Region, Uganda (2013-2017). Inset is the map of Uganda showing the location of West Nile Region.

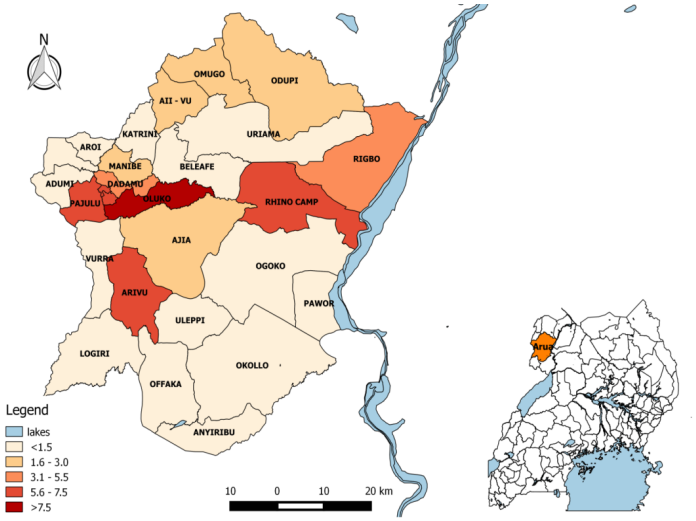

Figure 3: Map showing the proportion of TB cases with MDR-TB in sub-counties in Arua District, Uganda

Discussion: The association of poor adherence to first-line anti-TB drugs is consistent with findings found in other studies. Van der Werf *et al.* (2012) demonstrated that patients who had had an inappropriate treatment had a 27-fold risk of developing MDR-TB (4). Similar studies were reported in Bangladesh and India (5,6). Studies have also provided evidence for the association of HIV infection and development and MDR-TB. A systematic review found that a positive HIV status is associated with primary MDR-TB (7). Contrary to results from a survey conducted in India among Tibetan refugees (8), we found that being a refugee was not associated with development of MDR-TB. Frequent stock-outs of essential TB commodities negatively impact on adherence to anti-TB treatment.

Conclusion: There has been a high proportion of MDR-TB cases among TB cases in West Nile, Uganda since 2013. We recommended that the Ministry of Health ensures timely provision of adequate anti-TB commodities; intensifies directly observed therapy in health facilities and in communities; trains community healthcare workers in the basic management of TB cases; and expands the MDR-TB Ward at ARRH.

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Routine Mass Vaccination of Livestock to curb Cutaneous Anthrax Outbreaks in Arua District, Uganda Policy Brief

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Summary: *During May–June 2017, Arua District reported three suspected cutaneous anthrax patients (one death). All had recently handled meat from livestock that spontaneously died. A skin lesion from the deceased person and a blood sample from a bull that spontaneously died tested positive for Bacillus anthracis. Our investigation revealed that an anthrax outbreak probably occurred among livestock in Arua District since 2015, and humans contracted cutaneous anthrax by contact with livestock. Improving public heath surveillance and response in animals and humans is urgently required in the district. We recommend eating meat from slaughtered healthy livestock, safe disposal of animal carcasses, and livestock vaccination.*

Background: Anthrax is an acute zoonotic disease caused by Gram-positive spore forming bacteria *Bacillus anthracis* (Heymann, 2015). Human infection is infrequent and sporadic often a result of occupational hazards. Transmission is a result of handling and or consuming meat of infected livestock and occurs in three forms (Heymann, 2015). The cutaneous form accounts for 95% of human cases and is characterized by itching of affected site, skin lesion that is papular then vesicular evolving into a depressed eschar surrounded by edema. Incubation period is 5-7days with a case fatality rate of 5-20% (Heymann, 2015).

In Uganda, anthrax has occurred majorly amongst animals with occasional spillage to humans. In 2010, about 82 hippopotamuses and nine buffalos died from anthrax in Uganda. The anthrax strain was limited to the Kazinga channel. From the 1950s, hippos were the most affected animals since the strain thrives in water. In 2004, an anthrax outbreak killed lots of wildlife in Queen Elizabeth, there was no evidence of human infections so mass vaccination of livestock was done (CNN, 2010). There were concerns that human deaths had occurred from people eating infected hippopotamus meat (Wamboga-Mugirya, 2004). In 2011, there was an anthrax outbreak in Sheema district, killing two humans and seven bovines (Coffin, 2015).

On 7th May 2017, a Public Health Officer from Rhino Camp refugee settlements informed the District Surveillance Officer of Arua, about three suspected anthrax cases admitted at Olujobo Health Centre (HC) III presenting with acute onset of skin lesions evolving from papular to vesicular with depressed blackened center accompanied by some oedema. All the cases were children between 1 and 12 years. They started developing blisters after consuming meat of dead cow sand goats. In one of the homesteads affected, a total of 4 goats and 2 cattle died a few hours after onset of disease. These cases were from Kololo and Walope villages in Rigbo sub-county.

On 5th June 2017, the in-charge of Rhino Camp HC IV reported to Arua District Health Officer about the death of a 35 year old resident of Ledriva Village, Eramva Parish, Rhino Camp sub-county who presented with restlessness, sweating, confusion and was admitted on 4th June 2017. The papular-vesicular lesion progressed to an eschar. He first developed vesicles/blistering on the left scapular region one week before and was initially managed as suspected Herpes Zoster with no improvement at a clinic. At the HC IV, he was managed on a presumptive diagnosis of anthrax when the blisters were replaced by a black Eschar. Despite treatment, his condition deteriorated, with difficulty in breathing and died on 5th June 2017 amidst resuscitation attempts. A sample was taken from the skin lesion and this tested positive for *Bacillus anthracis*. A team from the Ministry of Agriculture, Animal Industry and Fisheries obtained a sample from a dead bull and this tested positive for anthrax.

We carried out an investigation to establish scope of the outbreak, determine exposure factors and recommend evidence-based control measures.

Approaches and Results: We held meetings with the District Health and Veterinary Teams and agreed to carry out a detailed epidemiological investigation. We also clearly defined roles of the participating teams. We mapped out the affected areas as Rhino Camp and Rigbo sub-counties. We carried out active case finding with the assistance of the Village Health Team members, Assistant Animal Husbandry Officer and other health facility staff in the sub-counties of Rhino Camp and Rigbo. We defined a probable case as acute onset of skin lesions progressing from papular to vesicular with depressed blackened center (eschar) in a resident of Arua district from 1st January 2015. A confirmed case was a probable case with *Bacillus anthracis* confirmed by PCR isolated from skin lesion.

We reviewed medical records and using a standard case investigation form, we interviewed 67 probable case-patients and relatives of the two deceased case-patients. We updated the line list and conducted descriptive epidemiology by person, place and time characteristics. The key variables explored were skinning/cutting a dead animal (carcass), eating a dead animal, carrying a dead animal, contact with live animals (milking) and contact with soil. We then generated a hypothesis and this was that all people who skinned/cut the dead animal and /orate the meat got cutaneous anthrax. We conducted a case-control study

to test the hypotheses. We identified 68 cases (67 suspected; one confirmed) including two deaths.

All cases occurred following spontaneous livestock deaths. Men (attack rate [AR]=17/100,000) were more affected than women (AR=0.78/100,000). Age group 30-39years (AR=63/100,000) were the most affected. All cases were from two neighboring sub–counties: Rigbo (n=63, AR=201/100,000) and Rhino Camp (n=5, AR=21/100,000). Cases occurred throughout the 3-year period, peaking during dry seasons. Of 68 case-persons and 136 controls, 65 (96%) case-persons and 76 (56%) controls butchered livestock that spontaneously died (OR_{M-H}=22, 95% CI=5.5–89); 61 (90%) case-persons and 74 (54%) controls carried meat (OR_{M-H}=6.9, 95%CI=3.0–16); 57 (84%) case-persons and 72 (53%) controls skinned the livestock (OR_{M-H}=5.0, 95%CI=2.3–11). 68 (98.6%) of the case-patients had their living rooms covered with soil. 100% of the case-patients do work where they come into contact with soil. The symptoms were suggestive of cutaneous anthrax, however other symptoms were suggestive of inhalation/ pulmonary, intestinal or meningeal anthrax.

Conclusion and implications: This anthrax outbreak might be widespread across Arua district and West Nile region. The outbreak is likely to have been caused by handling (skinning and/or cutting) of dead animals. If livestock are not vaccinated against Anthrax, similar outbreaks will occur in neighboring districts. This will culminate into socio-economic losses as a result of high morbidity and mortality of livestock.

Policy Recommendations

1. Strengthening community surveillance for early identification of cutaneous anthrax cases.
2. Initiation of vaccination of livestock against anthrax in Rigbo and Rhino Camp sub-counties and neighboring villages;
3. Enhancing coordination between the District Health Office and District Veterinary Office to raise alerts early and enable prompt control of the outbreak as well as strengthening community health education on dangers of handling and eating meat of dead animals including disposal. Further investigation of animal cases should be done to ascertain the risk to humans.

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Improve adherence to malaria test results to achieve the test and treat policy

Policy Brief

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Summary: *Malaria is one of the leading causes of morbidity and mortality in Uganda, with an estimated 6,000 deaths and 16 million cases reported in 2017. In 2011, Uganda changed its policy on management of malaria cases from treating every fever as malaria and adopted WHO's 'test and treat' policy. The new policy recommends that every suspected malaria case is subjected to a parasitological test by either a Rapid Diagnostic Test (RDT) or microscopy prior to treatment with antimalarial drugs. This is intended to avoid wastage of antimalarial drugs, improve management of febrile illnesses due to causes other than malaria, and possibly prevent the emergence and spread of drug resistance. We analysed data from the Uganda Malaria Surveillance Project (UMSP) routinely collected from outpatient registers in four malaria reference centres in Northern Uganda. We determined health workers' antimalarial prescription practices to patients who tested negative for malaria during 2015 – 2016. We found that 19% of patients who tested negative for malaria over this time period were prescribed antimalarial drugs. We recommend studies to determine reasons for health workers' continued prescription of antimalarial drugs despite negative test results which is against the country's test and treat policy, and institution of mechanisms to improve adherence to malaria test results.*

Introduction: Malaria is one of the leading causes of morbidity and mortality in Uganda, with an estimated 6,000 deaths and 16 million cases reported in 2017 (1) The disease is responsible for about 50% of all out-patient visits, almost a quarter of hospital admissions and up to 15% hospital deaths (2). World Health Organisation (WHO) recommends early, accurate diagnosis and prompt treatment of all positive cases with an effective antimalarial drug for effective disease management which is important for malaria control and elimination programs (3). To ensure that antimalarial drugs are only given to individuals that actually need them, WHO recommends that all suspected malaria cases with febrile illness should be subjected to parasitological testing using either microscopy or RDT. Treatment should only be given to individuals with positive test results. This will avoid wastage of antimalarial drugs, improve management of febrile

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illnesses due to causes other than malaria, and reduce the emergence and spread of antimalarial drug resistance which is a major threat to malaria control and elimination efforts globally (4).

In 2011, Uganda adopted the WHO recommended test and treat policy for malaria diagnosis and case management in the country (5). Previously malaria case management guidelines recommended treatment of every fever as a possible malaria case. We analysed malaria surveillance data from four reference centres under the UMSP to determine health-worker prescription practices given negative malaria test result.

Methods: We conducted a secondary analysis of malaria data from selected UMSP sites. These data were collected from out-patient registers of Aduku HC IV in Apac District, Anyeke HCIV in Oyam District, Lalogi HC IV in Omoro District, and Amolatar HCIV in Amolatar District for the period 2015-2016. During this period, UMSP reported treatment of patients with negative malaria test results with antimalarial drugs at these sites. We determined the proportion of outpatient visits that are suspected malaria, proportion of suspected malaria cases that are tested for malaria, proportion of patients with negative malaria test results that are prescribed antimalarial drugs during the study period.

Results : We found out that of the 378,513 patients that reported to the malaria reference centres during this period, 181,798 (48%) were suspected to have malaria. Of the suspected malaria cases, 155104 (85%) received a malaria test. Of the patients that were given a malaria test, 63058 (41%) tested negative. 19% of patients with negative malaria tests were prescribed antimalarial drugs.

Conclusion: There is sub-optimal adherence to the test and treat policy in the four malaria reference centres as evidenced by poor testing rates and prescription practices.

Implications and recommendations: The results show that Uganda's test and treat policy is yet to be fully implemented with 15% of the suspected malaria cases not accessing a laboratory malaria diagnosis. There is non-adherence to the malaria policy and treatment guidelines as about a fifth of patients with negative malaria test are given antimalarial drugs. Prescription of antimalarial drugs to patients with negative test results has previously been recorded in a study conducted in Uganda (6). In this study, 30% of patients who tested negative for malaria using RDT but were prescribed antimalarial drugs. Our study indicates persistence of this behaviour amongst health workers though at a slightly lower rate. To further understand and improve implementation of the malaria test and treat policy, we recommend studies to determine reasons for health worker continued prescription of antimalarial drugs despite negative test results. Institute mechanisms to improve adherence to malaria test results at health facilities.

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Evaluation of the Surveillance System in Adjumani Refugee Settlements, Uganda, April 2017

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Adjumani was one of the first districts to receive and resettle refugees since the onset of the South Sudan conflict in December 2013 and is currently hosting 201,400 refugees. The refugees are vulnerable to disease outbreaks and seasonal peaks of malnutrition. We conducted an evaluation of the surveillance system in Adjumani Refugee Settlements to identify the system strengths and weaknesses and recommend improvement measures. We determined attributes of the surveillance system using US Centers for Disease Control and Prevention guidelines for public health surveillance as a reference.

Introduction: Adjumani Refugee Settlement in West Nile was one of the first to receive and resettle refugees from South Sudan since the onset of the conflict in December 2013. Presently, it has a total of 201,400 Refugees. This makes the district vulnerable to disease outbreaks and seasonal peaks of malnutrition. For instance, since the start of the emergency, the refugee operations have had to deal with a measles outbreak in January 2014, the cholera outbreaks in 2015 and 2016 and cases of hepatitis B. We evaluated the public health surveillance system to determine if the diseases are being monitored efficiently and effectively (8). Every surveillance system should be evaluated periodically with recommendations to improve surveillance system usefulness, quality and efficiency (8),(9).

Methods

Study population: This evaluation was conducted among refugees in five settlements in Adjumani District. The participants from these settlements were health workers who were identified purposively. We interviewed surveillance focal persons and health facility in-charges.

Data collection and management: We conducted face to face inter-

views to collect information regarding the surveillance attributes i.e. reporting, tools, and data analysis using a semi structured questionnaire. We adapted CDC guidelines for evaluation of syndromic surveillance system to evaluate the system. Data cleaning and aggregation was done using Microsoft Excel.

Results

Description of the Evaluated system

Adjumani District uses the paper-based Integrated Disease Surveillance and Response (IDSR) system (11) where forms are used to collect data at community and health facility levels and then sent to the District Biostatistician. The district Biostatistician validates, cleans and approves the data before submission to the Ministry of Health (MoH).

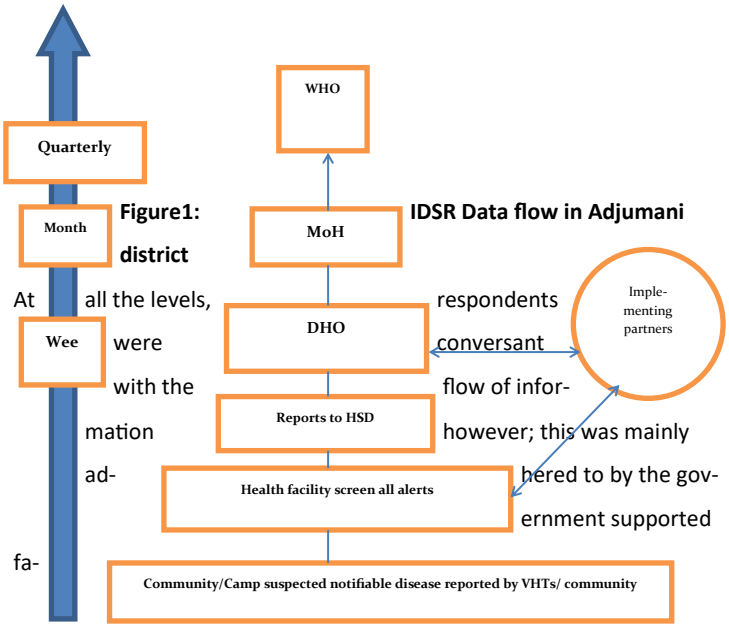

Figure1: IDSR Data flow in Adjumani district

At all the levels, respondents were conversant with the flow of information however; this was mainly adhered to by the government supported facilities. The implementing partners supported sites had another parallel system of reporting and were defaulting on reporting to the ministry of health Uganda recommended system. All the health workers reported lack of feedback from their superiors

MEASURE OF PREPAREDNESS	RESULTS
Presence of DEPPR	Yes, but non functional
Presence of comprehensive EPPR plans)	No
Availability of reporting tools	Yes
Buffer stock of essential medicines and health supplies	No
Presence of laboratory designated for case confirmation	Yes
Health DRRT trained on IDSR	Yes, preparing for previous outbreak
Community mobilization & sensitization activities implemented	Yes, mainly by implementing partners

Table 1: Epidemic preparedness measures in Adjumani District, April 2017

The district EPPR was present though found to be functional during times of outbreaks and disaster only. The case investigation forms were at the district level and lower facilities could only get them in case of suspected cases.

Data analysis and interpre-	**Drawing of graphs on priority**	**50%**
	Display information on priority diseases	0.0%
	Reported a suspected epidemic prone disease in the last 8 weeks	17%
	Laboratory results received from Reference Laboratories	100%
	Health facility has Surveillance Focal Person	50%
	At least one staff at health facility trained in IDSR	50%
Feedback	Health facility provides feedback to the community through VHTs	33%
	Health facility receives feedback from district	00%
	Weekly reports sent on time	36%
Epidemic preparedness	Knows how to estimate supplies in emergency situations	0.0%
	District leaders conducted supervisory visits	33%

Table2: Capacity of health facilities for analysis, interpretation, confirmation, and investigation of reported cases of epidemic prone diseases in Adjumani refugee settlements April 2017

Most of the health facilities had poor indices for IDSR indicators. There was no health facility that displayed information on priority diseases. All health facilities were ill prepared to handle emerging epidemics. There were no supplies for responding to epidemics and none of the facilities had capacity to estimate supplies for emergencies. Feedback mechanisms were found to be very poor from the district and national level.

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Attributes of the surveillance system for Adjumani District

Timeliness

Table 3: Timeliness for the facilities serving the Adjumani refugee settlements sampled for the first 12 Epi weeks 2017

Name of health facilities	Timeliness of the reports = 100* T/N	Completeness of reporting = 100
Adjumani Hospital	61.5	100
Mungula HCIV	53.8	69.2
Bira HCIII	84.6	100
Lewa HCII	61.5	100
Ayilo HCII	0	0
Ayilo HCII	30.8	53.8
Pagirinya HCII	0	0
Pagirinya HCIII	0	0

Simplicity

The system was found to be complicated in the structure as many of the health workers were not even aware of the standard case definitions. The case investigation forms were not readily available and one had to consult the DHOs office in case of suspected epidemic prone condition. This was more evident among the non-government facilities.

Flexibility

The system had failed to integrate the HIS with the recommended HMIS which offered immense challenges to the service providers majorly in the partner supported sites.

Acceptability

The health workers were willing to use the HMIS system. The non-government supported sites had a parallel structure through the HIS. **Data quality**

The reported formats in some of the non-government facilities were different which generally affected data quality.

Stability

The system was found to be unstable majorly because most health facilities were using the manual system to generate and store data (i.e., paper based). It was difficult to trace some reports in most health facilities. It was also found that the funding for surveillance activities was lacking in all facilities, with funds only being availed after outbreaks are confirmed.

Representativeness and completeness

50% of facilities assessed consistently reported in their monthly and weekly reports on the reportable diseases.

Conclusions: Adjumani District has a DRRT which is activated during outbreaks. The District Epidemic Preparedness and Response Committee (DEPPRC), were constituted but non-functional. The non-functionality of the structures impeded implementation of epidemic prevention, preparedness and response measures. Village Health Teams (VHTs) conducted Integrated Disease Surveillance and Response (IDSR) in the Adjumani resettlement camps and were the link to the communities. The non-government facilities had a parallel reporting structure which affected disease surveillance and response.

The reporting rates for most facilities was poor with government facilities (i.e., Adjumani hospital, Mungula HCIV, Biira HCIII, Lewa HCII) having late reporting and most of the NGO facilities were not reporting at all.

Recommendations

1. Need to harmonize the HIS and HMIS reporting systems in the district and appropriate tools availed accordingly by the DHO
2. Need to avail the case investigation tools, case definition booklets and charts, standard tools to all facilities both government and non-government.

The district health office should have a contingency plan in case of epidemics.

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Distribution of Tetanus in Uganda between 2012 and 2016

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Summary: *Tetanus is a nervous system disorder characterized by muscle spasms caused by the toxin-producing anaerobe Clostridium tetani, which is found in soil. Uganda validated the elimination of maternal and neonatal tetanus (MNTE) in 2011. However, it has the highest re-*

ported rates of non-neonatal tetanus (Non-NT) worldwide. A cross-sectional descriptive analysis of tetanus data from 2012 to 2016 shows an incidence of 10/100,000 population with Non-NT contributing the highest proportion. Kampala district recorded the highest incidence. A total of 1105 tetanus related deaths were recorded and majority due to Neonatal tetanus (NT). We recommend the scale up Tetanus toxoid (TT) vaccination for adult males and females and strengthen community-wide health education on the importance and benefits of TT for pregnant mothers in order to increase its utilization.

Introduction: Uganda validated the elimination of maternal and neonatal tetanus (MNTE) in 2011, however, it has the highest reported rates of Non-NT in the world [1] with a higher proportion of cases reported in women compared to men, which is unexpected as women receive tetanus booster doses during reproductive age and pregnancy. A three-dose primary series of penta-valent vaccine containing TT is provided to infants through routine immunization services at 6, 10, and 14 weeks of age [2]. Uganda does not provide the three WHO-recommended booster doses of TT containing vaccine (TTCV) at ages 12–23 months, 4–7 years, and 9–15 years. To prevent and maintain MNTE, up to five doses of TTCV are provided to women of reproductive age (WRA) [2]. High quality surveillance data is essential to monitor tetanus disease burden and guide national policy. We described the burden and mortality rates of tetanus as reported through HMIS and to provide recommendations to strengthen tetanus surveillance in Uganda.

Methods: We conducted a cross-sectional descriptive analysis of tetanus data reported through the Uganda HMIS between 2012 and 2016. Monthly and annual district level aggregated data on tetanus incidence was obtained from the District Health Information System (DHIS2) from 116 districts. Data was extracted by age (0–28 days, 1 month–4 years, and ≥5 years), sex, region and district. High reporting districts and health facilities with the highest cases were identified. We extracted both regional and district data to obtain trends in NT and non-NT cases. Selected data was downloaded into Microsoft excel and exported to Epi-info version 7.2.0 for analysis. The 2014 National Census data was extrapolated using an annual growth rate of 3.03% to carryout descriptive analysis on person, place and time. Incidence was calculated per 100,000 persons and distribution of age and sex was calculated. Results were presented in tables and graphs and QGIS was used to map tetanus in the districts of Uganda.

Results

Tetanus was grouped into NT and Non-NT (over 28 days of age). A total of 17,903 cases were recorded with males (56.1%) and females (43.9%). Age category 5-59 years had the highest (83.5%) number of cases (Table 1).

Table 1: Socio-demographic characteristics of tetanus cases in Uganda between 2012 and 2016

Variable	Category	Frequency (%)
Gender	Male	10027 (56.1)
	Female	7854 (43.9)
Category	Neonatal	1555 (8.7)
	Non-neonatal	16326 (91.3)
Age group	0-28 days	90 (1.7)
	29 days-4 years	74 (1.4)
	5-59 years	4346 (83.5)
	> 60 years	693 (13.3)

Incidence of Tetanus in Uganda between 2012 and 2016

The distribution of tetanus cases in Uganda has not been consistent for the five years under review but an increase in incidence was noted. Non-NT contributed the greatest proportion of tetanus cases with a high incidence of 12.7/100,000 in 2016. A slight rise was noted in 2012 to 2013 in the NT cases which subsequently drop till 2016, while the Non-NT cases gradually increased from 2012 to 2013, declined sharply in 2014 before a sharp increase followed from 2015 to 2016 where the highest peaks were recorded (Figure 1).

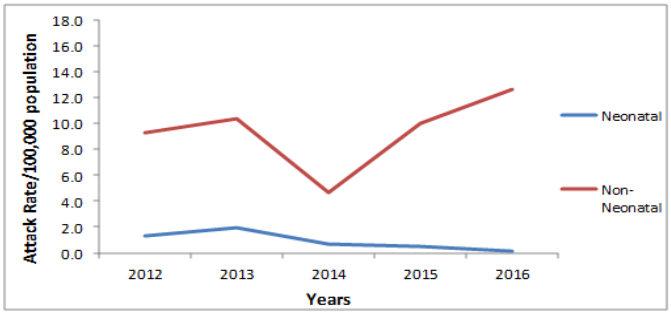

Figure 1: Incidence of NT and Non-NT between 2012 and 2016

Sex distribution of Non-NT cases between 2012 and 2016

Both males and females were affected, however males contributed the highest percentage of 50.8%.

Year	Male n (%)	Female n (%)	Total
2012	1400 (45.8)	1658 (54.2)	3058
2013	1574 (44.9)	1934(55.1)	3508
2014	1565 (45.0)	1911(55.0)	3476
2015	746 (44.7)	922(55.3)	1668
2016	3988(86.4)	628(13.6)	4616
Total	**7273 (50.8)**	**7053(49.2)**	**14,326**

Table 2: Sex distribution of Non-NT between 2012 and 2016

Distribution of Tetanus cases per district

Kampala reported the highest incidences for both NT and Non-NT. This was followed by Gulu for the NT and Kalangala for the Non-NT.

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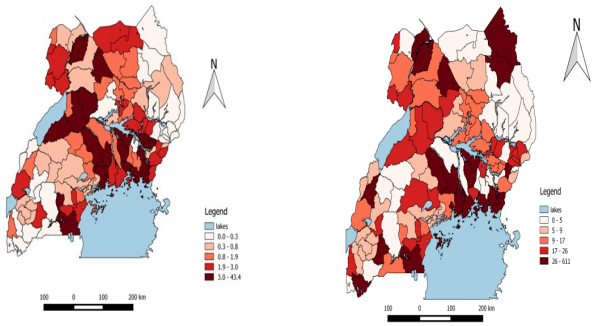

Figure 2: NT (left) and NNT (right) district incidences/100,000 population

Distribution of tetanus mortality per district between 2012 and 2016

Mayuge District reported the highest number of tetanus related death followed by Kampala and Mbale Districts. Four of the districts that reported the highest numbers (Mbale, Mayuge, Jinja, Soroti and Kamuli) are from the Eastern region.

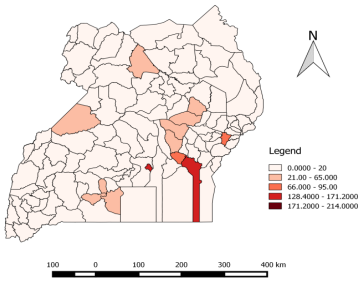

Figure 3: Tetanus mortality per district between 2012 and 2016

Health Facilities reporting the highest mortality between 2012 and 2016

Buluba Hospital in Mayuge district registered the highest numbers of Tetanus related deaths.

District	Reporting facility	n	(%)
Mayuge	Buluba Hospital	126	35.2
Jinja	Jinja Hospital	68	19.0
Mbale	Mbale Hospital	80	22.3
Kampala	Mulago National Referral Hospital	40	11.2
Kamuli	Kamuli Missionary	44	12.3
Total		**358**	**100**

Discussion: The shows existence of MNT (10.4/100,000 population per year) in Uganda despite it elimination in 2011. Nanteza, 2016 [3] found similar prevalence of 12% which is in line the study findings. Trend analysis for incidence rates showed the incidence of tetanus increasing per year between 2012 – 2016. Its still not clear if this high incidence depicts true increase in tetanus cases or data related issues like admissions of tetanus inpatients through the outpatients at the same facility, multiple OPD visits by the same patient, misdiagnosis or reporting errors. The highest percentage of tetanus cases in Kampala could be that it hosts the National Referral Hospital and treats patients nationally. Majority of the tetanus related death were attributed to NT cases and this is in agreement with Joy *et al*., 2005; Zupan, 2005 who implicated NT accounting for 38% of deaths in children younger than 5 years of age globally. Most non-NT cases were males who where not part of WHO's focus on the elimination of maternal and neonatal tetanus by 2015 whichled to vaccination strategies targeting women of reproductive age and infants (Thwaites, 2015). Less attention, however, has been given to the immunization of males after infancy. Reported high morbidities and mortalities seem over exaggerated, however there could be a lot of diagnostic differences, data capture and entry errors. Mbale and Mayuge had the highest mortalities being consistent with Nanteza, 2016 who reported similar districts as having high numbers of tetanus cases [3].

Recommendations: The government needs to refocus and scale up TT vaccination for adult males and females. Additionally, there is need for community-wide health education on the importance and benefits of TT for pregnant mothers in order to increase its acceptance and utilization.

Conclusion and Recommendations

Eradicating tetanus is possible and achievable using immunisation as the simplest and most cost effective way to reduce neonatal mortality rate. The government needs to refocus and scale up TT vaccination for adult males and females. Additionally, there is need for community-wide health education on the importance and benefits of TT for pregnant mothers in order to increase its acceptance and utilization.

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