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Dear Reader,

We take great pleasure in welcoming you to Issue 2 Volume 9 of the Uganda Public Health Bulletin.

We aim 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 Uganda.

In this issue, we present a variety of articles including: Mental illness among migrant domestic workers returning to Uganda from the Middle-East, Birth preparedness among pregnant women in Iganga-Mayuge District, Road traffic injuries, Intermittent Preventive Treatment utilization for malaria in pregnancy in Uganda, Rift Valley Fever outbreaks in Uganda, Pre-exposure Prophylaxis among Adolescent Girls and Young Women, Red eye outbreaks in Uganda Prisons and Schools, Imported Cholera outbreak, Food poisoning outbreak caused by *Aeromonas* bacteria at a funeral in Jinja District, Uganda, and several upcoming world public health awareness events.

Should you have any questions or require additional information related to articles in this bulletin please contact us on:

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We hope you find this information valuable and we shall appreciate any feedback from you.

Thank you

Inside this issue:

Incidence, perceptions, and experiences regarding mental illness among migrant domestic workers returning to Uganda from the Middle-East, 2019–2023

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Summary

Introduction: The labour export business in Uganda has grown over several years with increasing numbers of women being exported to the Middle-East for domestic work. In 2023, there was an alert raised about increasing numbers of migrant domestic workers (MDWs) returning with mental illness documented at Kazuri Medical Center at the airport. We profiled these returnees, estimated the incidence of mental illness among them, and explored perceptions and experiences of key stakeholders.
Methods: To identify and characterize cases, we reviewed records from the register of mentally ill returnees' at Kazuri Medical Center, 2019–2023. We estimated incidence as number of mentally ill returnees per 100,000 Ugandan domestic workers in the middle east per year. We conducted key informant interviews with labour export companies, returnees, and clinicians at Kazuri and Butabika to explore perceptions and experiences regarding mental illness among returning MDWs, and analysed these using inductive thematic analysis
Results: Overall, we identified 133 mentally ill returnees, during the study period. All were female, Median age was 31 years(range:21-46). Only 81(61%) had a country of employment documented among whom 44(54%) were from Saudi Arabia. Only 31(23%) had their companies documented among which 9(29%) were unlicensed. The number of mentally ill returnees increased from 26 in 2019 to 38 in 2023. The estimated incidence of mental illness among returnees dropped from 41/100,000 in 2019 to 11/100,000 in 2020 and by 2023 was 14/100,000. Perceived contributory factors to mental illness included isolation from family, heavy workload, physical/sexual abuse and prior history of mental illness; exacerbated by stringent contract terms. Traffickers/unlicensed companies were also a threat to these workers isolating them from the protections of the legitimate labour export system.
Conclusion: There was an overall decline in incidence of mental illness among Ugandan MDWs in the Middle-East from 2019–2023. Perceived contributory factors include isolation from family, work stress, prior history of mental illness, exacerbated by stringent contract terms; and traffickers may also play a role. Comprehensive mental health screening, counselling and anti-trafficking instruction should be instituted as part of the recruitment process for immigrant workers.

Background

Domestic workers, in general are faced with difficult working conditions, including long working hours, low pay, lack of legal protections, maltreatment, and social isolation. This is even worse among foreign domestic workers commonly referred to as migrant domestic workers (MDWs), who are far away from their social support structures and therefore more prone to stress, anxiety, depression, and other mental health disorders as a result (1–5).

The labour export business in Uganda has grown over the last several years with increasing numbers of women being exported to the Middle-East to work as house maids(6,7). On arrival in the Middle Eastern countries, these MDWs are placed in homes, their passports taken as insurance by their employers and are then put to work. A number of them are forced to return to Uganda under various circumstances including poor health. The details of these circumstances are not well documented, and since 2019, there have been reports of these MDWs returning from abroad with mental illness.

In 2023, reports from Kazuri Medical Center, which is a health care provider facility located at Entebbe International Airport, shows an increasing number of returnees diagnosed with mental illness or depression from 2019 to date; an average of 4 per month in 2023 alone. This facility is the only Health Care provider at the Entebbe International airport and attends to all returnees in need of medical care.

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On arrival from the Middle- East, these returnees are received by the aviation police following notification by the aircraft on which they travelled. They are then handed over to their relatives or taken to Kazuri Medical Centre from where they are linked to relatives or handed over to their recruiting agency.

As mental illness is increasingly becoming a matter of public health importance, we investigated these reports, profiled the migrant domestic workers returning from the Middle-East with mental illness from 2019–2023, estimated the incidence of mental illness among them and explored perceptions and experiences of key stakeholders regarding factors that might be contributing to mental illness among them.

Methods

Study design: We conducted a cross-sectional study using a mixed methods approach. We started off with a descriptive analysis of the data from mentally ill returnees at Kazuri Medical Center at Entebbe International Airport which is the first stop for returnees with mental illness. We also reviewed information from the External Employment Management Information System which keeps track of labour export in Uganda. We then conducted key informant interviews with labour export companies, returnees from the Middle East, and clinicians at Kazuri Medical Center and Butabika Hospital, the National Referral Hospital for treatment of mental health conditions.

Study site, setting, and population: We conducted the investigation among domestic workers returning from the Middles East at Entebbe International Airport, Wakiso District, Kazuri Medical Center which is the first stop for returnees with mental illness; and in Kampala which is the home for most of the labour exporting companies in the country (Figure 1). Documentation of mentally ill returnees at Kazuri was instituted in 2019 and since then, all returnees from the middle east who are considered mentally ill are documented in a special records file at the facility. On arrival, each returnee suspected to have mental illness is reviewed by a clinician, any documents they have including passport, national identification, employment records are copied and retained in the file. They are given 'first aid' and then handed over to their labour export companies, families or other custodians with a referral or recommendation for continued mental healthcare.

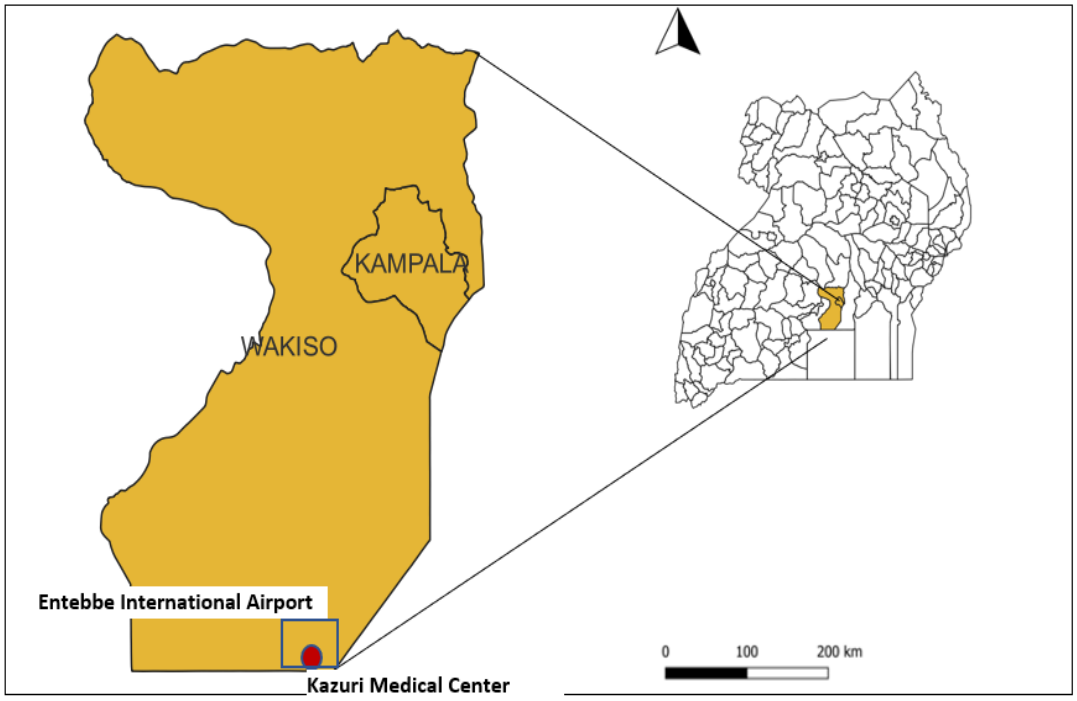

Figure 1: Location of Kazuri Medical Center, Wakiso District

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Study variables and data collection

Quantitative data: We abstracted demographic and clinical data on returnees diagnosed with mental illness on return from the Middle-East from 2019 to 2023 recorded in the mentally ill returnees' records file. We obtained data on number of MDWs in the Middle-East from the Ministry of Gender, Labour, and Social Development.

Qualitative data: We visited 7 Labour export companies where we interviewed managerial staff about their recruitment and monitoring processes as well as their knowledge, perceptions, and experiences regarding mental illness among returnees. We conducted telephone interviews with 6 mentally ill returnees and/or their relatives from whom we obtained information on their knowledge and experiences regarding mental illness among them. We also interviewed 6 returnees without mental illness to assess their knowledge and experiences. We visited Butabika National Referral Hospital which is country's only specialized mental health institutions. We interviewed 2 clinical staff from Butabika as well as 2 from Kazuri regarding on their knowledge, perceptions, and experiences regarding mentally ill returnees. The interviews were transcribed.

Data management and analysis

Quantitative data

Quantitative data entered and analysed in Microsoft excel to determine incidence and characterize the mentally ill returnees. We considered all records in the register from 2019 to 2023 and estimated incidence as number of mentally ill returnees per 100,000 domestic workers in the middle east in the same period. We profiled the returnees by summarizing the information available in their records.

Qualitative data

To explore the perceptions and experiences regarding mental illness among these returnees, transcribed data was reviewed and organized into themes and subthemes. We used the inductive thematic analysis approach to analyze the themes and subthemes and presented findings along the themes and also quoted some representative statements by respondents.

Ethics approval and consent to participate

We conducted this study in response to a public health alert and as such was determined to be non-research. The MoH authorized this study and the office of the Center for Global Health, US Center for Disease Control and Prevention determined that this activity was not human subject research and with its primary intent being for public health practice or disease control. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. §

§See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

We obtained permission from the Directors of Butabika National Referral Hospital and Kazuri Medical Center, and verbal consent from the respondents or their care givers all of whom were aged ≥18 years. Participants were assured that their participation was voluntary and that there would be no negative consequences for declining to participate in the investigation. Data collected did not contain any individual personal identifiers and information was stored in password-protected computers, which were inaccessible by anyone outside the investigation team.

Results

Profile of returnees with mental illness, Uganda, 2019-2023

We listed a total of 133 cases: 26 from 2019,14 from 2020, 19 from 2021, 35 from 2022, and 38 from 2023. All cases were above the age of 20 years and only 9(9%) were above 40 years (Figure 2).

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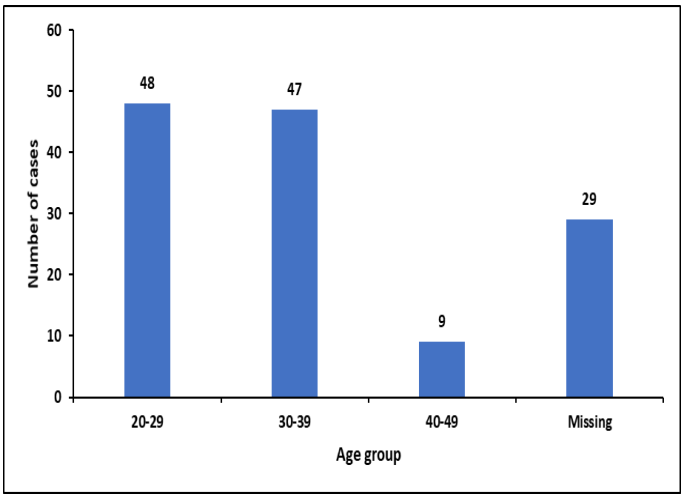

Figure 2: Age distribution of returnees with mental illness from the Middle East, Uganda, 2019–2023

For 52(39%) of the cases, the country from which they were returning was not documented but for those with records, all were from the Middle East (Figure 3).

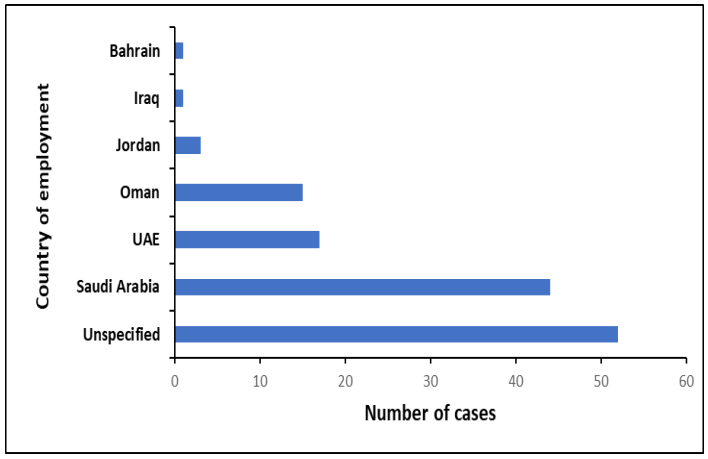

Figure 3: Distribution of returnees with mental illness by country of employment, Uganda, 2019–2023

Among the 133 returnees, only 31(23%) had their recruitment companies documented at Kazuri and of these, 9 (29%) were not licensed as of the time of data collection. Among the un-licensed, 2 were previously licensed but de-licensed in 2021. For 98 (74%) of the returnees, there was no documentation of how they left Kazuri Medical Center, while 23(17%) were documented as having been picked up by relatives, and 12(9%) by their recruitment companies. The cases were documented as having mental illness prompted by symptoms such as aggression, confusion, violent behaviour, abnormal speech, and muteness among others. Only 26(19%) had a specific diagnosis listed (Figure 4).

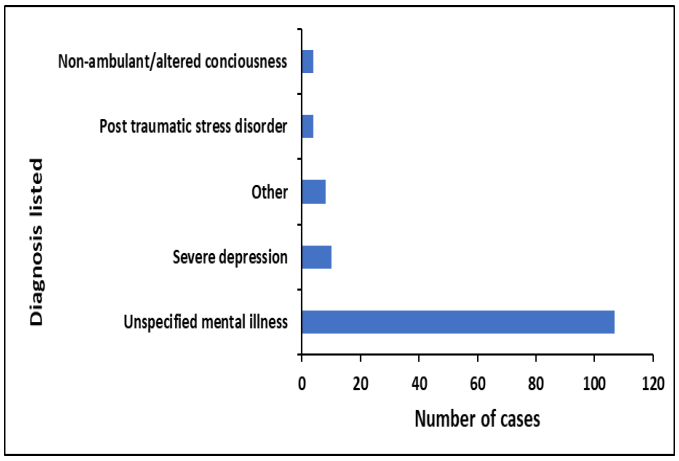

Figure 4: Clinical diagnosis of returnees with mental illness, Uganda, 2019–2023

Incidence of mental illness among domestic migrant workers from Uganda in Middle East, 2019-2023

The incidence of mental illness among returnees dropped sharply from 2019 to 2021, plateaued and then rose in 2023 (Figure 5).

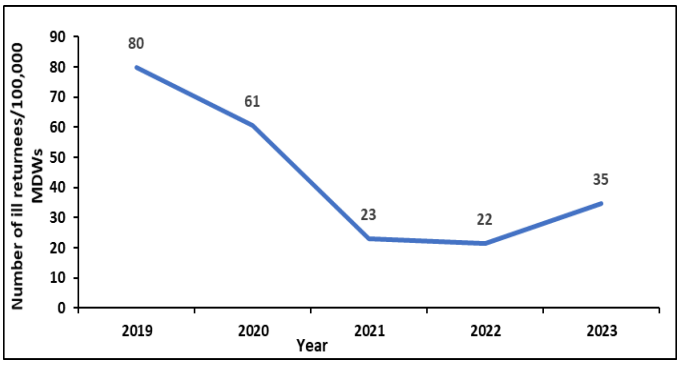

Figure 5: Incidence of mental illness among returnees, Uganda, 2019–2023

Perceptions and experiences regarding factors influencing mental illness among returnees from the Middle East, Uganda, 2019-2023

The themes identified included: Process of domestic labour recruitment, process of return from the Middle East, stressors/triggers of mental illness and mental illness in the general population

Process of domestic labour recruitment

We learned that there is a well-organized process

Continues to page 6

involved in export of domestic workers. Companies export between 20 to 50 domestic workers every month depending on the demand from the middle east and currently, these licensed companies only export domestic labour to Saudi Arabia and not to other countries with which Uganda reportedly has no domestic-labour trade agreements. To other countries they export non-domestic labour. Six out of seven of companies visited reported exporting only domestic labour while one reported exporting both domestic (only to Saudi Arabia) and non-domestic (to other countries).

During recruitment, mental health is screened by asking the recruits and their families whether or not there is history of mental illness; no actual mental health assessment is done: Socio demographic screening is also done to ensure that all recruits are above 20 years and their families are aware and consent to the recruitment and training at designated training centers pre-qualified by the liaison companies. Only those who pass these processes are then recruited and matched with families in the Middle East after which contracts are signed between the worker and the employer, mediated by the companies. Each contract is for 2 years and includes a standard monthly pay of UGX 900,000 paid directly by the employer to the maid, decent accommodation, access to phone calls and internet.

There is also a clear and functional reporting system in place for any complaints by the worker or employer which complaints are addressed by the companies accordingly sometimes requiring the transfer of the worker to another home or return to Uganda.

Process of return from the Middle East

We learned that Kazuri Medical Centre receives all domestic workers who are deported from the middle east with suspicion of mental illness. However, it was noted that it is possible that some are met on arrival by their relatives and do not pass through the clinic. Once at the clinic, the clinicians with the help of aviation police and Uganda Association of External Recruitment Agencies (UAERA) contact the responsible labour export companies and/or patients relatives to whom they are then handed over. It was reported that some workers feign mental illness in order to return home before the end of their contracts.

Stressors/triggers of mental illness

According to the labour export companies, mistreatment of workers is not common and when it occurs, there are mechanisms in place to address it. Any employer accused of this type of assault is blacklisted by the recruitment company and liaison office and will find it difficult to get another maid.

Some companies admitted knowledge of some maids returning with genuine mental illness although they say these are rare. They pointed factors like '*home sickness'*, family problems at home, extreme weather and work load as some of the factors that cause stress leading to mental illness among those who are genuinely sick. They also report that in some cases, these girls run away or are lured away from their work places by unscrupulous agents with the promise of greener pastures. In so doing, they are in breach of their contracts and liable for arrest and so they hide from their companies. Unfortunately, because they have no support system wherever they have run to, there is no telling what happens to them there.

According to the healthy returnees, they indeed they have heard stories and even met some mentally ill returnees. When asked about what they think was the cause of the illness, some said that it was witchcraft sent by ill-wishing relatives who did not want them to prosper, others said they did not know. They denied knowledge of any serious forms of abuse among their peers i.e. physical, sexual or other that might cause extreme stress and trigger mental illness. However, they pointed out some factors including too much time away from home, not being able to communicate with family, and family problems back home that might cause stress while abroad. Some reported experiences of their colleagues sending money back home and their relatives not being able to account for it as one of the stressors their colleagues have faced. Regarding their willingness to return to the Middle East despite knowledge of mental illness among returnees, they were positive that their experience would be different.

Regarding their personal experiences as domestic

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workers abroad, they mentioned a variety of pros and cons. The pros included: good pay, access to support from their offices both in Uganda and in Saudi Arabia where they are able to report any misconduct of their employers and any other problems they may face during their work abroad, access to phone-calls, and internet among others. The cons mentioned included: too much time away from home, '*too much work'*, sometimes the bosses are unkind and verbally abusive, late pay, and some male bosses make sexual advances. However, they reported that for the case of the cons, they are able to report to their companies and get support. They are willing to renew their contracts and return to work abroad. They also reported that as part of the recruitment process, they had undergone work training at a designated training company, gone through a medical screening process at a designated medical facility and had been briefed on what to expect once deployed. They were aware of the reporting processes in place.

From the mentally ill returnees and/or their relatives, we learned that some maids are recruited with existing mental illness that they do not disclose. Some relatives revealed that their patients were known to have mental illness before being recruited to work abroad. but had somehow managed to pass through the medical screening process without their illness being noticed.

Most of the relatives could not give details about the circumstances surrounding the onset of illness. Some of the patients reported witchcraft as the cause of their illness while others seemed unaware of their illness but could not point out a reason why or how they left the Middle east. There were no specific reports to suggest particular known risk factors for mental illness. Some relatives reported that their patients had since fully recovered while others reported persisting mental illness.

Based on their interactions with mentally ill returnees, clinicians cited factors including isolation from family, culture shock, extreme climate, sexual assault, physical abuse, and past history of mental illness as some of the risk factors they found in some of these patients

Mental illness in the general population

We learned that there has generally been an increase in young women of all professions attending the hospital with mental illness over the last few years among whom are a few domestic workers both from abroad and local from within the country. However, hitherto there was no particular interest accorded to this group and so their non-clinical information is not well documented making them difficult to trace. The more common occupations recalled included students, teachers, hairdressers, and business women. Some of the risk factors identified include increasing rates of substance abuse, gender-based violence, work stress, academic pressure, economic stress, relationship stress, and family history of mental illness.

Discussion

Most of the mentally ill returnees with a documented country of employment were from Saudi Arabia. Among the recruitment companies identified, almost one third were un-licensed. For most of the returnees, the specific mental illness was not named. There was an overall decline in incidence of mental illness among Ugandan MDWs in the Middle-East from 2019–2023. Factors perceived to be contributing to mental illness among returnees include long durations of isolation from family back home, heavy work load, extreme weather, prior history of mental illness, and abuse.

The incidence of mental illness among these returnees also dropped from 2019 through to 2021, remained the same in 2022 and rose in 2023. This drop in 2020 followed by a rise could be due to the travel restrictions due to COVID-19 in 2020. The subsequent rise could be due to relaxing of the travel restrictions after COVID-19. Among factors perceived to be contributing to mental illness among these returnees, there was no specific report of physical or sexual abuse among the returnees interviewed but has been known to happen rarely and it is thought that most of those who experience this kind of abuse are those who are trafficked by illegal or unregistered agents (9–11).

The incidence of mental illness in Uganda is re

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portedly on the rise as has been severally documented in the media and published research(12–14). Uganda ranks sixth among the countries burdened with mental illness in Uganda and more females than males are affected(13,15). This likely explains why even among migrant domestic workers; the numbers are high. Documented risk factors in the country include stress from work and personal relationships, domestic violence substance abuse, poverty among others(14).

Diagnosis of mental illness is still a challenge in Uganda and the fact that only a few cases had a specific diagnosis made is an indicator of the lack of capacity even among health care workers to identify and diagnose specific mental health disorders. is generally lacking in Uganda even among health care workers.

The majority of returnees with a country of employment documented were from Saudi Arabia which can be explained by the reports that currently all companies registered to export domestic workers only do so to Saudi Arabia which reportedly the only country with which Uganda has an MOU for export of domestic workers. However, we also see returnees from other countries which raises questions about the circumstances under which these workers were taken to those countries which according to reports from the labour export companies should only be trading in non-domestic labour.

According to the External Employment Management Information System, there are currently over 10,000 jobs available in the Middle East, 72% of which are for domestic workers in Saudi Arabia (16). Most of the returnees with documented countries from which they were returning came from Saudi Arabia. This matches reports and figures from the ministry of gender, labour and social development which estimate that an average of 400 Ugandan migrant workers are exported daily to mainly Saudi Arabia, United Arab Emirates, and Qatar with Saudi Arabia alone taking almost 90% of the labour exported(7,17). Given the reports that licensed companies only export domestic labour to Saudi Arabia and not to other countries, there is a question about why a considerable number of these returnees are from Oman, Jordan among others. Are there systems in place to protect the workers in these countries?

Since 2019, the number of labour export companies continues to grow translating into a corresponding increase in number of domestic workers exported. Still in 2019, Uganda suspended the trading licenses of several labour export companies. citing several violations of human rights (6, 8,17,18,). Among the returnees registered at Kazuri, only 31(23%) had their recruitment companies documented, of which 9 (29%) are not licensed today according to the EEMIS register of labour export companies(8). Some of these unlicensed companies are among those that had their licenses suspended in 2019 while for others there is no documentation of them ever being licensed (8,16). This raises a question about whether those whose companies were not documented by Kazuri were recruited by licensed agencies or independent agents or traffickers as has been known to happen(9).

The domestic labour export industry has been streamlined to ensure protection of migrant domestic workers. All registered companies are available in a database accessible to the public so that potential recruits are able to verify their companies(16). There are also clear reporting mechanisms incase of maltreatment by employers. Despite this, as with many other industries, there are reports of illegal agents who are not amenable to the existing regulatory mechanisms and therefore jeopardize the safety of these workers after unlawfully recruiting them. There is also the possibility of some legal agents that do not prioritize the safety and wellbeing of their recruits. This is in keeping with documented reports on the same(11,12).

All these mechanisms should offer a certain degree of protection to domestic workers abroad. Nonetheless there are still several potential stressors faced by these workers that may not be amenable to a streamlined recruitment system for example size of the workload, isolation from family, stringent terms of contract especially duration, among others. Physical and sexual abuse may also be perpetrated against domestic workers despite the systems in place to mitigate this as no system can be full proof. Existing mental illness is also a risk factor among these workers, one which the screening processes

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are probably not equipped to detect. This is evidenced by the fact that among the returnees we documented were some with known history of mental illness that had precluded them from alternative occupations. This indicates a gap in the medical screening process and highlights the need to address this issue accordingly.

Study limitations

We estimated the numbers of mentally ill returnees using records from Kazuri Medical Center which might have been an underestimation given the possibility that not all the mentally ill pass through the facility. Documentation of the mentally ill returnees at Kazuri Medical Center was not complete as evidenced by a lot of missing/unspecified information.

Conclusion

There was an overall decline in incidence of mental illness among Ugandan MDWs in the Middle-East from 2019–2023. Perceived contributory factors include isolation from family, work stress, prior history of mental illness, exacerbated by stringent contract terms; and traffickers may also play a role.

Recommendations

Labour export companies should consider revising the duration of the contracts of domestic workers to allow more flexibility and reduce the stress associated with having to spend 2 whole years isolated in a foreign country.

Thorough and comprehensive mental health screening should be done during the recruitment process before these workers are exported.

Investigations into trafficking of workers by independent agents working outside EEMIS should be conducted.

Conflict of Interest

The authors declare that they had no conflict of interest.

Authors contribution

BGN, SW, DA and BK: participated in the conception, design, analysis, interpretation of the investigation findings and report writing. BK and RM reviewed the report. BGN wrote the draft bulletin article and BK, RM and ARA reviewed the article to ensure intellectual content and scientific integrity.

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Birth preparedness and complication readiness among pregnant women in a population-based cohort in Eastern Uganda, 2006–2018

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Summary

Background: Uganda is one of the Sub-Saharan countries with a high maternal mortality ratio estimated at 336 deaths per 100,000 live births. Birth preparedness and Complication readiness (BPCR) is an effective strategy for reducing maternal and neonatal mortality. In Uganda, there is limited information on the level and factors associated with BPCR. We determined the level of Birth BPCR and

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associated factors among pregnant women in Eastern Uganda, 2006–2018 to inform programming.
Methods: We analyzed secondary data from the Iganga-Mayuge Health and Demographic Surveillance Site (IMHDSS) in Eastern Uganda. We extracted data on demographics and BPCR risk factors for pregnant women,2006–2018. A woman was considered prepared for birth and its complication if she practiced at least 3 of the following during pregnancy: identified health facility for place of delivery, saved money for the purpose of pregnancy and childbirth, decided to deliver by skilled provider, and had made provision for baby's clothes. We evaluated factors associated with BPCR using multivariable logistic regression.
Results: We identified 4,472 pregnant women of which 3,800 **(**85%) were prepared for birth and its complications. The mean age of pregnant women was 28 years (range:13-47). Pregnant women aged ≥35 years (adjusted odds ratio (aOR)=1.5, 95%CI=1.0041-2.2), Antenatal care (ANC) attendance (aOR=13, 95%CI=4.5-40), wealth index (fifth quintile/wealthiest: aOR=2.7, 95%CI=1.8-4.2, fourth quintile: aOR=1.7, 95%CI=1.2-2.5, and third quintile: AOR=1.4, 95%CI=1.1-1.7), level of education (secondary education: aOR=1.6, 95%CI=1.1-2.3, tertiary education: aOR=4.1, 95%CI=1.8-9.4), residence (peri-urban: aOR 1.5, 95%CI=1.1-2.0), and male partner involvement in ANC (aOR=1.3, 95% CI=1.1-1.6) were associated with BPCR.
Conclusion: Most pregnant women were prepared for birth and its complications. Women with higher wealth index, secondary education and above, attended ANC visits, and those whose partners were involved were prepared for birth and its complications. We recommend promoting ANC attendance especially in areas with poor utilization of ANC services, and involving male partners in BPCR could help improve pregnancy outcomes. Promoting women's education and socioeconomic status may help improve BPCR.

Introduction

According to the World Health Organization (WHO), approximately 287, 000 women died during and following pregnancy and childbirth in 2020 globally and about 70% of the maternal deaths occurred in Sub-Saharan Africa(1). In 2020, the Maternal Mortality Ratio (MMR) in low-income countries was 430 per 100,000 live births (1). Uganda was one of the Sub- Saharan countries with a high maternal mortality ratio (MMR) estimated at 336 deaths per 100,000 live births (2).

Birth preparedness and complication readiness (BPCR) interventions in developing countries is associated with reduction in maternal and neonatal mortalities (3). BPCR refers to a plan organised during pregnancy in preparation for a normal birth and in case of complications. Birth preparedness for a woman entails identifying a skilled health provider, identifying a health facility for delivery, arranging means of transport and saving money for an obstetric emergency, and arranging blood donors during childbirth (4). BPCR is associated with factors such as age of the mother, level of education, antenatal care, knowledge of danger signs, delivery at a health facility, and assistance from community health workers. In 2022, Uganda developed the essential maternal and neonatal care clinical guidelines which provides for birth and emergency preparedness, and prevention and management of life-threatening complications of pregnancy and childbirth (5).

Though the benefits of BPCR in improving pregnancy outcomes in both mothers and newborns have been documented in several countries, little information is currently available on levels of BPCR among pregnant women and associated factors in Uganda. We assessed BPCR and associated factors among pregnant women in Eastern Uganda, 2006–2018 to inform programming.

Methods

Study design, data source, and setting

We analysed BPCR-related surveillance data from the Iganga Mayuge Health and Demographic Surveillance Site (IMHDSS) generated during 2006-2018. Iganga Mayuge Health and Demographic Surveillance Site was established in 2005. It is located in the Iganga and Mayuge districts in Eastern Uganda, approximately 120 km from Kampala city. The IMHDSS consists of 65 villages in seven sub-counties spread over a 155km^2 area with a population of 94,568 at the end of 2017. The average household size is five individuals, and the area is predominantly rural, with some peri-urban areas. Subsistence agriculture is the main occupation and sex distribution is roughly equal, with 51% female. Approximately 45% of the population is less than 15 years old and 27% of the population are adolescents aged 10-19. The IMHDSS is an open population cohort and collects longitudinal data on pregnancy outcome (live birth, still birth, abortion, miscarriage), attendance of antenatal care during pregnancy, place of delivery among others (6).

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Study population
We considered records for all women aged 13-47 years who got pregnant or gave birth irrespective of the outcome from 2006–2018 and lived in the Iganga and Mayuge Health Demographic Survey Site for at least 4 months. The 13-47year age-group was considered based on the available secondary data.

Study variables and data abstraction
We abstracted data from the paper based surveillance data. The dependent (outcome) variable was BPCR (Yes, No). A woman was considered prepared for birth and its complication if she practiced at least 3 of the following practices during pregnancy: identified health facility for place of delivery, saved money for the purpose of pregnancy and childbirth, decided to deliver by skilled provider, and had made provision for baby's clothes while those who had practiced less than 3 practices were considered not prepared (4). The independent variables included socio-demographic factors (age, marital status, level of education, residence), maternal factors (gravidity, parity, ANC attendance, pregnancy outcome), and male partner involvement in BPCR, and economic factors (Wealth index).

Data analysis
We exported data to STATA version 14 software for analysis. Categorical data was summarized as frequencies and proportions, and continuous data such as age was summarized in mean. To classify wealth index, principal components analysis (PCA) was run on the 11 household assets evaluated. The household items included owning: 1) a radio, 2) a television, 3) a mobile phone, 4) a bicycle, 5) a motorcycle, 6) a motor vehicle, 7) a piece of land, 8) large animals such as cattle, goats and sheep, 9) small animals such as poultry, 10) a manufactured bed, and 11) the nature of the walls of their house. The principal component on which most assets loaded was used to generate a wealth index score for each participant. Participants were then grouped into wealth quintiles (five quintiles in descending groups): the lowest quintile, representing the relatively poorest quintile of the participants and fifth quintile, representing the wealthiest participants.

Multivariable logistic regression analysis was used to determine the factors associated with BPCR among pregnant women in Eastern Uganda.

Ethical considerations
The Iganga Mayuge Health and Demographic Surveillance Site provided administrative clearance to conduct this study. In addition, we received a non-research determination clearance from the US Centers for Disease Prevention and Control (US CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. § §See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. No informed consent from participants was sought since secondary data was used. We ensured confidentiality and the data were kept under lock and key to avoid disclosure of personal information of the respondents to members who were not part of the study.

Results

Socio-demographic characteristics of pregnant women in Iganga-Mayuge Demographic Surveillance Site, 2006–2018
A total of 4,472 women gave birth between 2006 and 2018.The mean age was 28±7 years with minimum and maximum ages of 13 and 47 years, respectively, and 10% were aged ≤19 years. Of the 4,472, the highest proportion were aged 25-35 years 2,202 (49%), followed by age-group of 20-24 years 983 (22%). The majority of the women were married

Characteristic	Frequency (n)	%
Age in years		
13-19	440	10
20-24	983	22
25-34	2,202	49
36-47	847	19
Marital status		
Never married	431	10
Married	2,531	57
Cohabiting	1,247	28
Formerly married	263	6
Education level		
No formal education	261	6
Primary level	2,535	57
Secondary	1,401	31
Tertiary	275	6
Residence		
Rural	2,994	67
Peri-urban	1,478	33
Wealth index		
First quintile (poorest)	933	21
Second quintile	1,069	24
Third quintile	924	21
Fourth quintile	744	17
Fifth quintile (wealthiest)	802	18

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2,531 (57%) from rural areas 2, 994 (67%) and had primary level education 2,535 (57%) (Table 1).

Table 1: Socio-demographic characteristics of the pregnant women in Iganga Mayuge Health and Demographic Surveillance Site (IMHDSS), 2006–2018, (N=4,472)

Level of birth preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018

Of the 4,472 pregnant women, 3,800 (85%) were birth prepared. The most common birth preparedness practice was making provision for buying baby clothes at 4,326/4,472 (97%). However, only 223 (5%) of the 4,472 mothers reported to have saved money for delivery or complications (Table 2).

Table 2: Birth preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018, (N=4,472)

Component	Frequency	%
Identified a health facility		
No	575	13
Yes	3,897	87
Identified skilled birth attendant		
No	603	13
Yes	3,869	87
Bought child clothes		
No	146	3
Yes	4,326	97
Saved money for delivery		
No	4,249	95
Yes	223	5
Classification of BPCR		
Not prepared (<3 preparations)	672	15
Well prepared (≥3 preparations)	3, 800	85

Factors associated with birth preparedness and complication readiness among pregnant women, Iganga-Mayuge Demographic Surveillance Site, 2006–2018

At bivariate analysis level, age, marital status, residence, wealth index, level of education, parity, ANC attendance, male partner involvement in ANC were significantly associated with BPCR (Table 3).

At multivariate analysis, age of the pregnant woman, residence, education level, wealth index, ANC attendance, and male partner involvement in BPCR were significantly associated with BPCR. Pregnant women aged ≥35 years were 1.5 times more likely to be prepared for birth and its complications compared to teenage pregnant women aged 10-19 years (aOR 1.5; 95% CI 1.0041-2.3, p=0.048). Pregnant women with secondary level of education were 1.6 times (aOR 1.6; 95% CI 1.1-2.3, p=0.012), and tertiary level were 4 times (aOR 4.1; 95% CI 1.8-9.5, p=0.001) more likely to be prepared for birth and its complications compared to those with no formal education. Pregnant women from households in higher social economic status (SES) were more likely to be birth prepared compared to women whose households had a lower SES. Pregnant women in fifth quintile were 2.7 times (aOR 2.7; 95% CI 1.7-4.2, p=<0.001), fourth quintile were 1.7 times (aOR 1.7; 95% CI 1.2-2.55, p=0.002), and third quintile were 1.4 times (aOR 1.4; 95% CI 1.1-1.7, p=0.01) more likely prepared for birth and its complications compared to those in first quintile (poorest). Pregnant women who attended ANC were 13 times (aOR 13.4; 95% CI 4.6-39.6, p=<0.001) more likely prepared for birth and its complications compared to those who never attended ANC. Pregnant women residing in the peri-

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urban setting were 1.5 times (aOR 1.5; 95% CI 1.09-2.0, p=0.011) more likely prepared for birth and its complications compared to those who resided in rural setting. Pregnant women who had their male partners involved were 1.3 times (aOR 1.3; 95% CI 1.08-1.6, p=0.005) more likely prepared for and its complications compared to those who had no male partners involved (Table 3).

Table 3: Factors associated with Birth Preparedness and complication readiness among pregnant women, Iganga Mayuge Health and Demographic Surveillance Site, 2006–2018

Characteristic	Birth preparedness		aOR(95%CI)	P value
	No (n)	Yes (n)		
Age group, years				
13-19	71	369	1	
20-24	136	847	1.1(0.77-1.5)	0.61
25-34	338	1,864	1.1(0.77-1.6)	0.61
35-47	127	720	1.5(1.0041-2.2)	0.048*
Residence				
Rural	561	2,433	1	
Peri-Urban	111	1,367	1.5(1.09-2.0)	0.011*
Education level				
None	51	210	1	
Primary	473	2,062	1.1(0.76-1.5)	0.76
Secondary	141	1,260	1.6(1.1-2.3)	0.012*
Tertiary	7	268	4.1(1.8-9.5)	0.001*
Wealth index				
1st quintile (poorest)	206	727	1	
2nd quintile	204	865	1.2(0.97-1.5)	0.090
3rd quintile	148	776	1.4(1.08-1.7)	0.010*
4th quintile	74	670	1.7(1.2-2.5)	0.002*
5thquintile (wealthiest)	40	762	2.7(1.7-4.2)	<0.001*
ANC attendance				
No	12	5	1	
Yes	660	3,795	13.(4.6-40)	<0.001
Male partner involvement				
No	488	2552	1	
Yes	184	1248	1.3(1.08-1.6)	0.005*
Parity				
1	102	680	1	
2-4	251	1665	0.94(0.71-1.25)	0.68
≥5	319	1455	0.79(0.57-1.08)	0.14

*statistically significant p<0.05

Discussion

The study revealed that 85% of pregnant women were prepared for birth and its complications. Higher education level, higher wealth index, older age, ANC attendance and male partner involvement in ANC were associated with BPCR.

The majority, 85% of the pregnant women were well prepared for birth and its complications. This proportion is higher than findings of previous studies in Ethiopia (30.6%), (7) Rwanda (22%) (8) and Uganda (28%)(9). The high proportion of well-preparedness could be attributed to adequate counselling on BPCR during ANC attendance(10).

We found that pregnant women who had attained secondary education and above were more likely to be birth prepared for birth and its complications than pregnant women who had no formal education. This finding is in consonance with findings of similar studies where education was found to be positively

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and significantly associated with BPCR (11). Educated women have good health seeking behaviour including increased utilisation of maternal health services, have adequate decision-making power in matters related to their health and are most likely to have fewer financial constraints in accessing healthcare (12).

Pregnant women aged ≥35 years were more prepared for birth and its complications compared to teenage women aged 13 to 19 years. This is in consistence with other studies where older women (≥35 years) were 2.6 times more likely to have adequate birth preparedness than their colleagues who were under 25 years of age (13). A possible explanation for this relationship may be that older women would have experienced complications on their previous pregnancies, thereby trying to prevent any such problems for the current pregnancy (14).

Pregnant women with higher socio-economic status were more likely prepared for birth and its complications than those in the lower socio-economic status. This finding coincides with a study conducted in Ethiopia, where mothers in the fourth quintile were more likely well prepared for birth and its complications than those in the third, second or first quintile (15). This might be due to the fact that women in the higher quintile have better opportunity for education, professional occupation and increased health seeking behavior (15, 16).

Pregnant women who attended ANC were more likely to be prepared for birth and its complications. This was in line with other studies conducted in Kenya, Tanzania and Ethiopia, where for instance in Ethiopia, mothers who attended ANC follow-up visit were 3.67 times more likely prepared for birth and its complications than those who had no ANC follow up visit.(11, 17). During routine ANC, women are counselled on the birth preparedness and its complications, and helped to plan their birth.

In this study, peri-urban residents were more prepared for birth and its complications than rural residents. This is supported by the study in Ethiopia (11, 18). This might be due to improved access to information, education, and availability of maternal health services (11).

Study limitations

We did not consider knowledge of obstetric danger signs while assessing BPCR because that information was lacking from the data collected at IMHDSS. There could also be information bias as the survey was conducted every after one year.

Conclusion

Overall, most pregnant women were prepared for birth and its complications in Iganga and Mayuge Districts. Age, level of education, wealth index, ANC attendance and male partner involvement were associated with BPCR. Improving the women's education and socio-economic status as well as encouraging ANC attendance could help improve BPCR. Involving male partners during BPCR could help improve the pregnancy outcome.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors contribution

All authors contributed to the write-up and review of the bulletin. MK wrote the drafts of the manuscript and revised the paper for substantial intellectual content. BK, RM, IK, and ARA reviewed the bulletin for substantial intellectual content. MK collected secondary data. RM, BK, and ARA participated in the supervision of data collection and reviewed the draft bulletin for substantial intellectual content. All the authors read and approved the final version of the bulletin.

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Temporal and spatial distribution of road traffic injuries, Uganda, 2012–2023

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Summary

Background: Road traffic injuries (RTIs) rank sixth among causes of death and fourth for disability in Uganda. In 2019, Uganda's RTI mortality was 29 per 100,000, higher than the global average of 18 per 100,000. Although the Uganda Ministry of Health (MoH) collects RTI data in the District Health Information System (DHIS 2), recent trends have not been analyzed to inform programming. We analyzed DHIS2 data to examine RTI trends and distribution in Uganda, 2012–2023.
Methods: We extracted data on RTIs for 2012–2023 from DHIS2 and determined the annual trends of RTIs per 100,000 population. We used data from 2015–2023 to determine the annual trends of motorcycle RTIs and data from 2020–2023 to determine

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the semi-annual trends of RTIs among males and females and deaths due to RTIs using the mid and end-year populations. We determined the significance of the trends using Mann-Kendall test.
Results: There was a decline in all RTIs from 411 to 357/100,000 population (p=0.034) between 2012–2023. However, admissions due to RTIs increased from 77 to 116/100,000 (p=0.034). The incidence of RTIs involving motorcycles did not change (211-232/100,000, p=0.47) while RTIs from other causes decreased (429 to 176/100,000, p=0.0049). Mortality due to RTIs dropped from 14 to 7/100,000 (p=0.0094) between 2020–2023. Males were more affected by all RTIs (224/100,000) compared to females (144/100,000) (p=0.0000304). Motorcycle RTIs affected more males (126/100,000) compared to females (72/100,000) (p=0.00012). RTI-related deaths among males (14/100,000) were not different from deaths among females (7.1/100,000) (p=0.13). RTI-related deaths among persons ≥20 years (27 deaths/100,000) were not different from deaths among persons <20 years (18 deaths/100,000) (p=0.18). The incidence of RTIs declined in most districts but persisted between 1,000-4,000/100,000 in Obongi and Kampala City.
Conclusion: While there was a decline in the overall incidence of RTIs due to RTIs, the rise in severe injuries requiring hospitalization highlights ongoing challenges. Motorcycle-related RTIs predominantly affecting males and adults (≥20 years) necessitates targeted interventions. Despite progress in reducing mortality rates, particularly at emergency departments, continued investment in comprehensive road safety strategies, emergency medical services, and public health interventions is imperative further to mitigate the burden of RTIs.

Background

Road traffic injuries (RTIs) are among the primary public health problems in Uganda, causing significant morbidity and mortality (1). According to the Global Burden of Disease Study 2019, RTIs were the sixth leading cause of death and the fourth leading cause of disability-adjusted life years (DALYs) in Uganda (2). The mortality rate from RTIs was about 29 per 100,000 population in 2019, which is much higher than the global average of 18 per 100,000 (2).

According to the Uganda Ministry of Works and Transport (MoWT), road traffic crashes are responsible for an average of 10 deaths per day and the main cause has been careless driving (2,4). According to the 2022 Uganda Police Force (UPF) annual crime report, 21,473 people were involved in RTAs and 1,712 (8%) of them were slightly injured, 15,227 (71%) were severely injured, and 4,534 (21%) died on spot (4). The number of RTI victims in 2022 increased by 19% compared with those registered in 2021. About 34% of the victims were pedestrians, 33% were motorcyclists, 13% were passengers on motorcycles, 11% were passengers in motor vehicles, 5% were motor vehicle drivers, and 4% were cyclists (4).

Data on RTIs are captured by UPF at the accident scene mostly in urban areas and on the major highways. The RTIs that are not detected and recorded by the UPF go unreported especially those that occur away from police presence, those that occur in the rural areas and those involving motorcycles and bicycles (5). It is not a common practice for individuals to self-report RTIs to police in Uganda and Africa and this makes the number reported by police much lower (6,7). According to a study by Muni et al, the official police records of road traffic fatalities in Uganda are significantly underreported (8). Additionally, the fatalities reported by UPF are always recorded immediately after the crashes. However, more deaths continue to occur hours and days later while the victims are in health facilities (9).

In 2010, the Uganda Ministry of Health (MoH) started capturing data on RTI victims that seek care from health facilities using the District Health Information System (DHIS2), an online database used for health information management in Uganda (1).

Most of the RTI victims in Uganda seek health care from public and private health facilities and their data are captured and reported in the DHIS2. Although the MoH collects RTI data, recent trends have not been analyzed to determine whether there has been progress in reducing RTIs in Uganda. We analyzed DHIS2 data to examine RTI trends and distribution in Uganda, 2012–2023, to inform programming.

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Methods

Study design and data source

In 2010, the MoH started reporting aggregated data on RTI victims seeking care at out-patient departments (OPD) and those admitted in in-patient departments (IPD) in health facilities through the DHIS2 and by 2012, the quality of the RTI data in DHIS2 had improved. Since 2015, the MoH started capturing data on RTIs due to motorcycles and from 2020, the RTI data were further disaggregated by sex, age, and other causes like bicycles and pedestrians (10).

Study variables, data abstraction, and analysis

We extracted OPD and IPD data on RTIs from 2012–2023 from the DHIS2 database. The OPD data included information on the RTI victims managed at the health facility and the deaths due to RTIs at emergency units. The IPD data included information on admitted RTI victims and deaths due to RTIs among in-patients.

We extracted data on overall RTIS, admissions due to RTIs, RTIs due to motorcycles, RTIs due to other causes, and mortality due to RTIs. Overall RTIs were determined as a total number of individuals who sustained injuries as a result of road traffic crashes, including pedestrians, cyclists, motorcyclists, and vehicle occupants reported in DHIS2. Admissions due to RTIs were cases of RTI victims that required admission to IPD in health facilities reported in DHIS2. Road traffic injuries due to motorcycles were individuals who sustained injuries specifically involving motorcycles, including motorcyclists, their passengers, or individuals hit by motorcycles reported in DHIS2. Road traffic injuries due to other causes were individuals who sustained injuries resulting from other vehicles (for example cars and trucks), bicycles, and pedestrian incidents not involving motorcycles.

Mortality due to RTIs was deaths occurring as a result of road traffic injuries reported in DHIS2. We also extracted data on the annual OPD and IPD reporting rates from DHIS2, which were already calculated by dividing the number of reporting facilities by the total number of facilities expected to report. These reporting rates helped to ensure the consistency and completeness of the reporting data to validate trends and identify any anomalies or gaps in reporting.

We determined the incidence of RTIs, admissions due to RTIs and deaths due to RTIs per 100,000 population using population estimates from Uganda Bureau of Statistics (11). We used data from 2012–2023 to determine the annual overall RTIs incidence and data from 2015–2023 to determine the annual incidence of RTIs due to motor-cycle. We used data from 2020–2023 to determine the semi-annual incidence of RTIs among males and females and deaths due to RTIs using the mid and end-year population estimates. We determined the significance of the trends using Mann-Kendall test. We demonstrated the spatial-temporal distribution and trends of RTIs using Quantum Geographic Information System (QGIS) maps.

Ethical considerations

This study used routine surveillance data reported by health facilities in the DHIS2 which were also aggregated with no individual patient identifiers. However, we obtained administrative clearance to use the data from the Uganda Ministry of Health. The US Centers for Disease Control and Prevention (CDC) also determined that this activity was not human subject research and its primary intent was for public health practice or disease control. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. §§See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

Results

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Annual proportion of road traffic injuries by cause and associated hospital admissions, Uganda, 2020-2023

From 2020 to 2023, motorcycles consistently caused most of the RTIs 82,089 – 87,881 (53-55%), followed by pedestrians 30,126 – 34,462 (19-21%), motor vehicles 25,914 – 33,378 (16-21%), and bicycles 10,395 – 13,820) (7-9%). The total admissions increased from 46,679 (29%) to 58,780 (37%) (Table 1).

Table 1: Annual distribution of road traffic injuries by cause and associated hospital admissions, Uganda, 2020 – 2023

Time (years)	2020	(%)	2021	(%)	2022	(%)	2023	(%)
RTI cause								
Motor vehicles	25,914	(16)	30,425	(19)	33,378	(21)	27,772	(17)
Motorcycles	85,106	(54)	86,820	(53)	82,089	(53)	87,881	(55)
Bicycles	13,820	(9)	12,611	(8)	10,395	(7)	10,854	(7)
Pedestrians	33,550	(21)	33,959	(21)	30,126	(19)	34,462	(21)
Total RTIs	158,390	(100)	163,815	(100)	155,988	(100)	160,969	(100)
Admissions	46,679	(29)	53,560	(33)	51,071	(33)	58,780	(37)

Trend of all road traffic injuries and associated admissions, Uganda, 2012-2023

From 2012–2014, there was an increase in the incidence of RTIs from 411/100,000 to 552/100,000, corresponding with an increase in the OPD reporting rate. Since 2015–2023, there was a significant decline in the incidence of RTIs from 552/100,000 to 357/100,000 (p-value = 0.034), despite the increase in the OPD reporting rate. The incidence of admissions due to RTIs increased significantly from 77/100,000 in 2012 to 116/100,000 in 2023 (p-value = 0.034), corresponding with an increase in the IPD reporting rate (Figure 1).

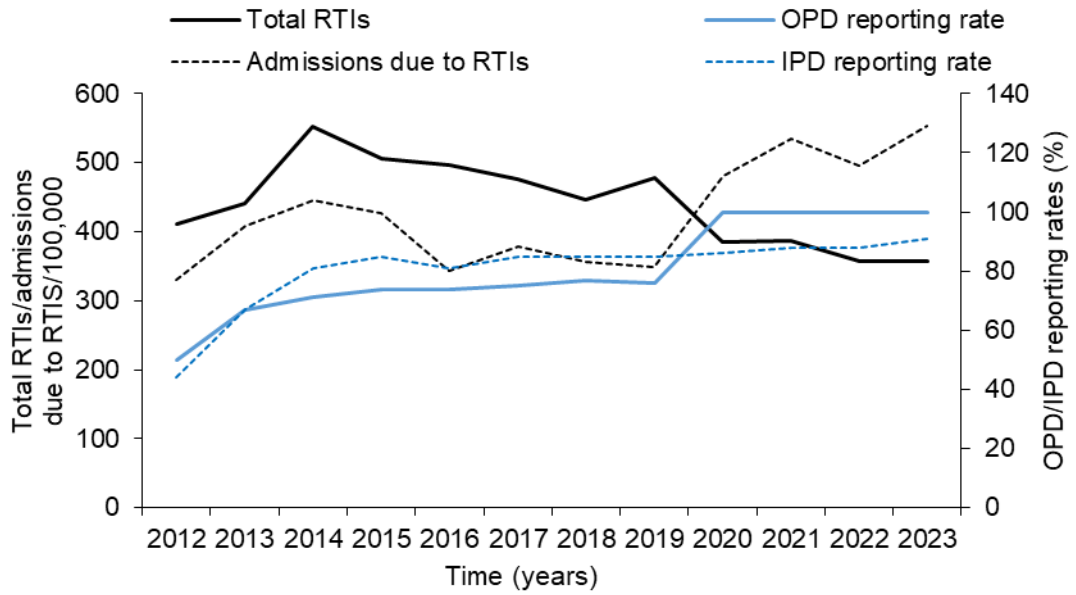

Figure 1: Annual trends of incidence of all road traffic injuries and associated admissions, Uganda, 2012–2023

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Trend of road traffic injuries due to motorcycles and other vehicles, Uganda, 2015-2023

The incidence of road traffic injuries due to motorcycles increased from 123/100,000 in 2015 to 232/100,000 in 2016 where it stagnated until 2023 (p-value =0.47). The incidence of road traffic injuries due to other causes (motor vehicles, bicycles and pedestrians) declined significantly from 429/100,000 in 2015 to 176/100,000 in 2023 (p-value = 0.0049). Since 2015, the incidence of road traffic injuries due to other causes was higher than that due to motorcycles until 2020 when the incidence of road traffic injuries due to other causes declined below that due to motor cycles (Figure 2).

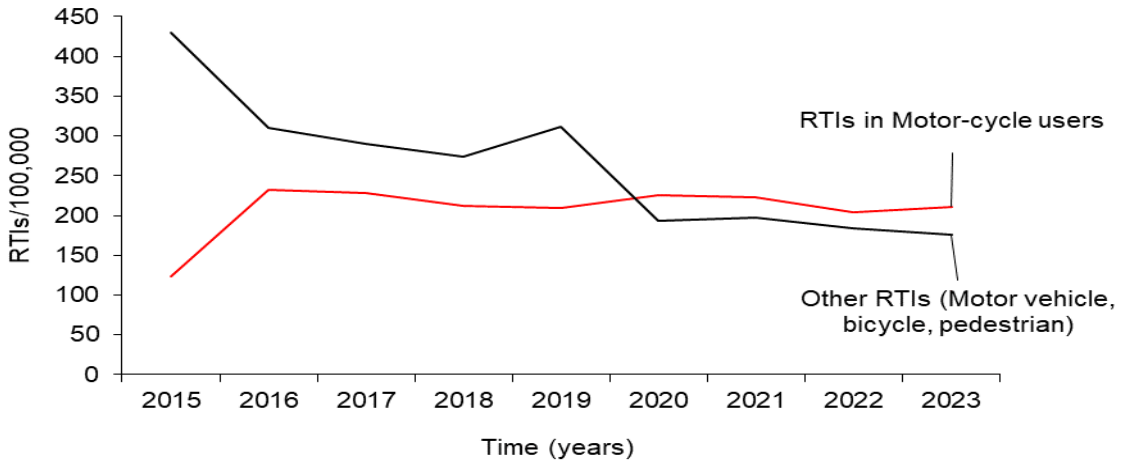

Figure 2: Annual trends of incidence of road traffic injuries due to motorcycles and other causes, Uganda, 2015–2023

Trend of mortality due to road traffic injuries, Uganda, 2020-2023

The mortality due to RTIs at emergency department declined significantly from 14 deaths/100,000 in January 2020 to 7.1/100,000 in December 2023 (p-value =0.0094) while that at the IPD stagnated at around two deaths/100,000 in the same period (p-value = 0.11) (Figure 3).

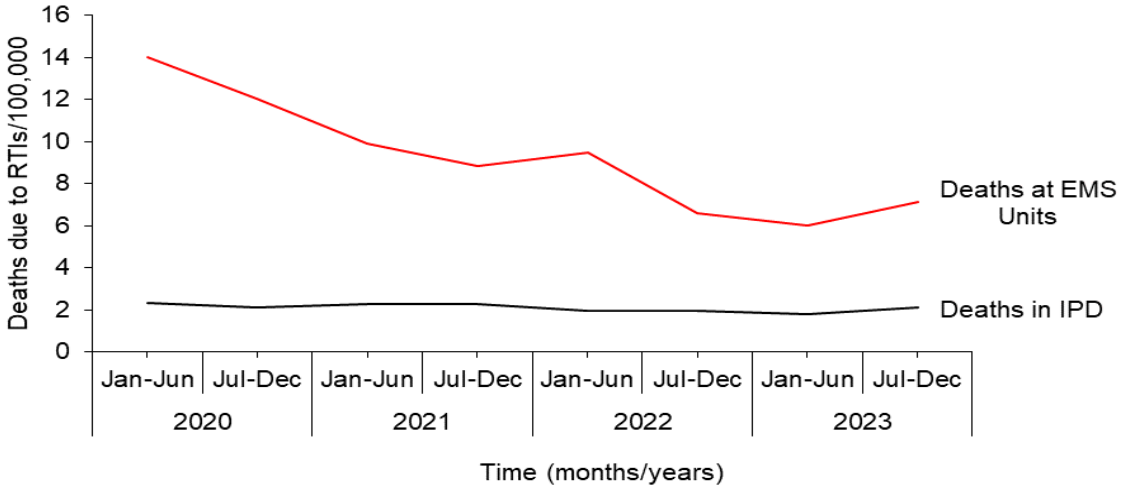

Figure 3: Trends of deaths due to road traffic injuries at emergency units and in the in-patient departments, Uganda, 2020–2023

Incidence of road traffic injuries and associated deaths among males and females and different age categories, Uganda, 2020-2023

From 2020–2023 when the MoH started disaggregating RTI data by sex, males were more affected by all RTI causes with an average RTI incidence of 224/100,000 compared to females with an average RTI incidence of 144/100,000 (p=0.0000304). The incidence of RTI due to motor cycles were higher in males with an average incidence of 126/100,000 compared to females with an average incidence of 72/100,000 (p=0.00012). The deaths rates due to RTIs among males compared to females

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and that among persons aged ≥20 years compared to persons aged <20 years were not significantly different (Table 2).

Table 2: Annual incidence of road traffic injuries and associated deaths among males and females and different age categories, Uganda, 2020–2023

	2020	2021	2022	2023	Average	p-value
All RTIs /100,000						
Male	250	221	205	221	224	0.0000304
Female	149	139	148	140	144	ref
RTIs due to motor-cycle/100,000						
Male	141	123	117	124	126	0.00012
Female	77	71	69	71	72	Ref
Total deaths due to RTIs/100,000						
Male	17	14	12	11	14	0.13
Female	9.4	7.2	6.2	5.8	7.1	Ref
Deaths at emergency unit due to RTIs/100,000						
<20 years	25	19	15	14	18	0.18
≥20 years	37	27	25	20	27	ref
Deaths in the IPD due to RTIs/100,000						
<5 years	7.8	3.9	3.6	2.1	4.4	0.81
5+ years	3.1	4.1	3.6	4.0	3.7	ref

Trend of incidence of road traffic injuries by districts, Uganda, 2012-2023

From 2012 to 2016, there was an increase in the incidence of RTIs in most of the districts. Thereafter, there was decline in most of the districts except Obongi and Kampala City where the incidence of RTIs persisted between 1,000-4,000/100,000 (Figure 4).

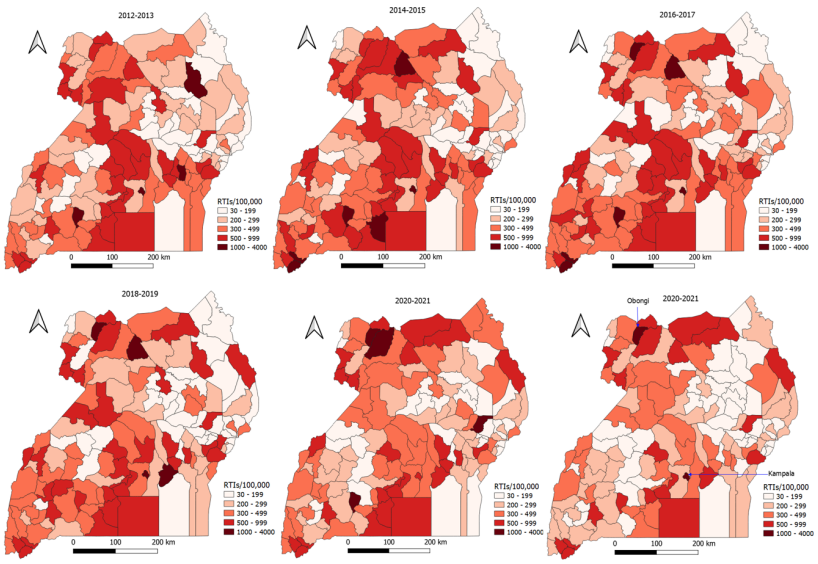

Figure 4: Trend of two-year average incidence of road traffic injuries by districts, Uganda, 2012-2023

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Discussion

We reveal a notable overall decline in the incidence of RTIs in Uganda from 2012 to 2023, with significant reductions observed from 2015 onwards. We also found a significant decrease in mortality due to RTIs at emergency departments. Despite these positive trends, RTI-related hospital admissions have increased. The analysis showed disproportionately higher RTI incidence and mortality among males and adults aged ≥20 years. Motorcycles were the leading cause of RTIs, with persistently high RTI incidence and disproportionately affected males more than females. Our spatial analysis highlighted that the incidence of RTIs persisted over 1,000/100,000 population over time in Kampala city and Obongi District.

The observed decline in the incidence of overall RTIs in Uganda especially notable from 2015 coincides with the implementation of enhanced road safety measures and public health interventions. Uganda adopted the 2011–2020 United Nations' resolution on decade of action for road safety with a target of reducing RTIs by 50% by 2020, which was renewed in 2021 for the next 10 years (12,13). During this period, there were efforts to improve road safety management and increase safer roads, vehicles, and users (14). This could explain this decline in the incidence of RTIs.

The declining mortality due to RTIs is a positive indication and suggests potential effectiveness of interventions aimed at reducing fatalities due to RTIs. These interventions include improvements in pre-hospital care, such as timely access to emergency medical services and trauma centers, as well as advancements in hospital-based care, including surgical interventions and intensive care management. In 2021, the Uganda MoH operationalized the emergency medical services policy and strategic plan to improve emergency medical services (pre-hospital and hospital care) (15). Additionally, public awareness campaigns promoting safer road behaviors, enforcement of traffic regulations, and infrastructure enhancements might have contributed to this decline in mortality (16). However, it's essential to note that the mortality rate among the inpatients stagnated at around two deaths per 100,000 population during the same period, indicating the need for continued efforts to enhance care for admitted RTI victims.

The increase in admissions may reflect improved access to healthcare services or changes in reporting practices but underscores the ongoing burden of RTIs on the healthcare system. This implies that there is still a long way to achieve the target of reducing severe road traffic injuries by half by 2030 (17). A study by Biribawa et al also found a nonsignificant decline in severe RTIs between 2012–2016 in Kampala using data from UPF (18).

Despite this progress, challenges persist, particularly in addressing the underlying risk factors contributing to RTIs and fatalities. For instance, the disproportionate burden of RTI mortality among males compared to females underscores the need for targeted interventions addressing gender-specific risk behaviors and vulnerabilities on the road. These findings are consistent with other findings in Uganda and globally and could be explained by the fact that men are more involved in driving and riding vehicles than women(19–21). According to the Insurance *Institute for Highway Safety* (IIHS), the number of male crash fatalities has been more than twice as high as the number of female crash fatalities for almost every year between 1975–2021 (22). Additionally, men are also more likely to involve in risky driving and riding behaviors than women like drunk driving, over speeding, and not using seat belts (23).

Similarly, the higher mortality rates among adults aged ≥20 years highlight the importance of interventions tailored to this demographic group, such as driver education programs and workplace safety initiatives. These people are the working age and their injuries or deaths cause huge social and economic harm to their society. The high risk in this age group is consistent with other findings all over the world (19).

The number of motorcycles used for commercial transportation of passengers is rapidly increasing in Uganda mainly because of their affordable price to purchase, swiftness, and easy to beat traffic jams in urban roads, easy to connect many streets and roads among others (24). The motorcycle crashes are high mainly because most operators are not trained and licensed and most do not adhere to traffic safety regulations like using crash helmets and reflector jackets (19,21). Efforts to reduce RTIs due to motorcycle are crucial for mitigating the burden of RTIs in Uganda. Efforts like enhanced rider education programs and stricter enforcement of traffic laws, could yield substantial benefits in reducing the incidence of RTIs due to motorcycles and associated fatalities.

The gender disparities also underscore the importance of gender-sensitive interventions aimed at promoting safer motorcycle riding practices and reducing risk-taking behaviors among male riders.

The high incidence of RTIs in Kampala city could be

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explained by the high traffic concentration of vehicles especially motorcycles and pedestrians. In addition, Kampala city hosts national referral hospitals and several other hospitals which receive, manage, and report patients referred from several districts. However, it is not clear why the incidence persisted high in Obongi Districts. This warrants further investigation to ascertain the circumstances associated with this high incidence.

Study limitations

While our study provides valuable insights into road traffic injuries (RTIs) in Uganda, some limitations should be acknowledged.

Firstly, our analysis relied on secondary data extracted from the DHIS2 database, which may be subject to reporting biases, underreporting, and data quality issues inherent in routine surveillance systems and hence we are likely to have underestimated the study outcomes.

Additionally, the focus on healthcare facility data may underestimate the true burden of RTIs, as it excludes cases that do not seek medical care or are treated outside of formal healthcare settings and deaths on accident scene.

Lastly the spatial analysis was based on the reporting district not the district where the RTI occurred. This has a risk of exaggerating the burden in districts hosting referral hospitals.

Conclusion

This study underscores the urgent need for sustained efforts to address the significant public health challenge posed by RTIs in Uganda. While there has been a promising decline in the overall incidence of RTIs, the rise in severe injuries requiring hospitalization highlights ongoing challenges. Motorcycle-related RTIs, predominantly affecting males, have emerged as a leading cause of injuries and fatalities, necessitating targeted interventions to promote safer road behaviors and improving motorcycle safety measures. Despite progress in reducing mortality rates, particularly at emergency departments, continued investment in comprehensive road safety strategies, emergency medical services, and public health interventions is imperative to further mitigate the burden of RTIs and save lives on Uganda's roads.

Recommendations

Based on the findings of our study RTIs in Uganda, we propose the following recommendations to address the identified challenges and improve road safety:

Firstly, implementing comprehensive road safety education programs for road users, with a focus on promoting safe driving practices, importance of helmet use, and pedestrian safety awareness by the MoH and UPF could reduce severity of RTIs, admissions, and mortality due to RTIs.

Secondly, the increasing enforcement of existing traffic laws, including speed limits, seatbelt usage, and helmet laws by the UPF through stricter penalties and enhanced police patrols, particularly in high-risk areas would reduce on the incidence and severity of RTIs.

Thirdly, there is need for the MoH to expand access to emergency medical care to enhance access to timely and quality emergency medical care for RTI victims by investing in emergency response systems, equipping healthcare facilities with necessary resources, and training healthcare workers in trauma management to reduce mortality among the RTI in-patients.

In addition, the UPF, MoH, MoWT could develop targeted interventions tailored to address the specific needs of high-risk groups, such as young adult males and motorcycle riders, including targeted education campaigns, training programs, and community outreach initiatives. These could reduce RTIs among young adult males.

Furthermore, the MoH needs to strengthen the capacity for RTI data collection and surveillance systems, including enhancing the accuracy and completeness of data captured in health information systems. In addition, integrating data from MoH and UPF could provide a more comprehensive understanding of RTI trends and patterns.

Lastly, the spatial distribution of RTI particularly in areas with persistently high incidence like Obongi District and Kampala City, needs further evaluation, targeted interventions and resource allocation to address district specific disparities.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' contributions

AK participated in the conception, design, analysis, interpretation of the study and wrote the draft bulletin. BK, RM, DK, EJN, JK, IM reviewed the report and the drafts of the bulletin for intellectual content and made multiple edits to the draft bulletin; BK, LB, and ARA reviewed the final bulletin to ensure intellectual content and scientific integrity.

All authors read and approved the final bulletin.

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Trends and distribution of Intermittent Preventive Treatment utilization for malaria in pregnancy, Uganda, 2017-2022

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Summary

Background: sulfadoxine-pyrimethamine'In Uganda, malaria in pregnancy prevalence ranges from 8.9% in low transmission arears to >50% in high transmission area, and in 2019, 152 (4.3%) of the 3,528 maternal death were due to malaria in pregnancy. At least 3 doses of sulfadoxine-pyrimethamine' (IPTp-SP3) given during antenatal care (ANC) is expected to prevent malaria in pregnancy, reduces its negative effects, and additionally reduce cases of malaria in pregnancy. As of 2015, the recommended target for IPTp-SP3 utilization in Uganda is ≥ 66%utilization. Despite significant progress in ANC attendance, the extent of IPTp-SP utilization in Uganda remains unknown. We determined the trends in IPTp-SP3 utilization among ANC attendees and its relationship with malaria in pregnancy (MIP) during 2017–2022.
Methods: We extracted data on IPTp-SP3, ANC attendance (ANC1 and MIP from the District Health Information System 2 (DHIS2), 2017–2022. We calculated the national, regional, and district IPTp-SP3 utilization as the proportion of pregnant women (number who had attended ANC1) who received at least 3 doses of IPTp-SP3 during 2017–2022. MIP was calculated as a proportion of pregnant women with malaria who attended ANC1. Mann-Kendall test was used to evaluate significance of linear trends.
Results: Despite the overall IPTp-SP3 utilization increasing from 2.5% to 50% during 2017–2022, it was below the recommended target of ≥ 66%. Regions of South Buganda (-33%), Karamoja (-19%), and Bukedi (-13%) experienced a decreasing trend in IPTp-SP3 utilization during the period 2017–2022, while only Acholi (+30) and Toro (+27%) regions had an increasing trend in IPTp-SP3 utilization during the period 2017–2022. Malaria in pregnancy cases increased from 12% to 22% during the period 2017–2022, despite a rising trend in percentage IPTp3 utilization across the period.
Conclusion: There was suboptimal IPTp-SP3 utilization in Uganda from 2017–2022, with the target ≥ 66% utilization not achieved. Declining trends in IPTp-SP3 utilization may result to an increase in malaria in pregnancy. Further investigation into reasons for low uptake of IPTp-SP3 among pregnant women, particularly in regions with declining IPTp-SP3 utilization could provide insights to help improve uptake.

Background

Malaria remains a major public health concern, especially among pregnant women and children under five years of age (1, 2). Over 30 million women in Africa become pregnant in malaria-endemic areas, where they are at higher risk of malaria infection compared to non-pregnant women (1, 2). Malaria in pregnancy (MIP) is often associated with unfavorable outcomes, such as stillbirth, low birthweight, pre-term delivery, abortion, and maternal death (1, 2). According to the Uganda Malaria Indicator Survey 2015, malaria among pregnant women accounts for about 14% of outpatient services utilization, 11% of admissions, and 9% of deaths (3). This is critical considering that key strategic interventions exist to prevent and control malaria transmission during pregnancy (3),

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To reduce morbidity and mortality associated with malaria, the World Health Organization (WHO) recommended the use of the Intermittent Preventive Treatment for malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) in 2000, alongside other preventive and curative interventions. Intermittent Preventive Treatment for malaria in pregnancy using 3 doses of sulfadoxine-pyrimethamine protects between 65% and 85% of pregnant women from placental malaria infection (4, 5, 13). Subsequently, the Uganda National Malaria Control Division (NMCD) revised the national IPTp-SP policy from two doses of IPTp-SP as a directly observed treatment strategy during routine antenatal care (ANC) to three or more doses of IPTp-SP3 during ANC (5). The three or more IPTp-SP doses are linked to a greater mean birth weight and fewer low birth weight (LBW) newborns than the two doses (12). Additionally, the NMCD revised the national target for IPTp-SP3 uptake from 85% to ≥ 66% IPTp -SP3 utilization.

Although pregnant women in many districts of Uganda (16) have registered progress in ANC attendance (65% in 2013 to 90% in 2022), the extent of IPTp-SP3 utilization remains unknown in Uganda. We determined the trends in utilization of IPTp-SP3 among ANC attendant's registrants and its relationship with malaria in pregnancy in Uganda, 2017-2022.

Methods

Study setting

Uganda comprises 15 health regions, of which two (West Nile and Acholi Regions) are considered areas with high annual malaria transmission rates (annual parasite index (API) >450 cases/1,000 population), five (Lango, Karamoja, Teso, Bukedi, and Busoga Regions) are considered medium malaria transmission areas (API=251-450 cases/1,000 population), and six (South Central, North Central, Kampala, Ankole, Tooro, Bugishu, and Bunyoro Regions) are considered low malaria transmission areas (API=101-250 cases/1,000 population). Kigezi Region is considered to have very low malaria transmission, with API≤100 cases/1,000 population/year (Figure 1)and is targeted for malaria elimination in the Uganda National Malaria Strategic Plan 2025 (14,15,16).

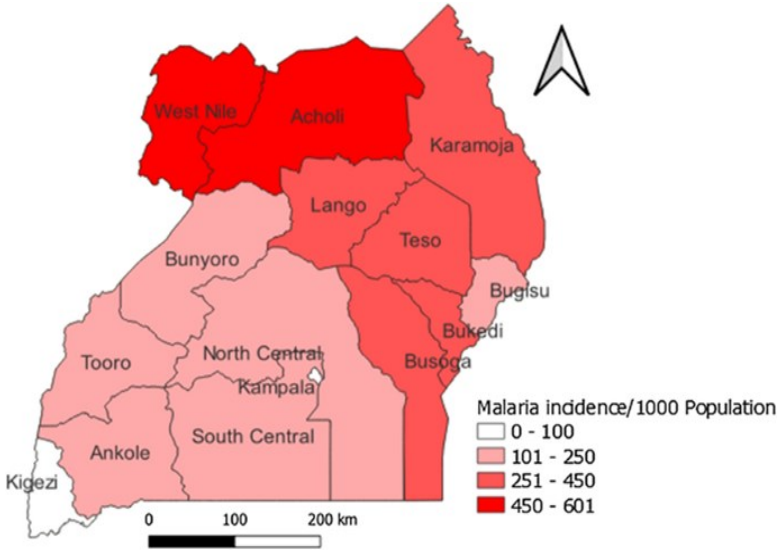

Figure 1: Malaria incidence by region, Uganda, 2023

Study design, data source, and variables

We performed a descriptive analysis of routinely reported surveillance aggregated data. These data are summarized at health facility level using the Health management Information System, form 105 and then entered in the national electronic District Health Information System version 2 (DHIS2) [7]. The HMIS Form 105 is a report on outpatient department (OPD) attendances, diagnoses, maternal and child health (MCH), HIV/AIDS service, laboratory and stock status of essential drugs and supplies, among others [7], which is compiled by the health facility and submitted to MoH through the DHIS 2 at the end of every month. We extracted data on total monthly ANC attendance, total monthly first ANC, total monthly 4+ANC attendance, total monthly IPTp-SP3 utilization, and annual antenatal clinic malaria in pregnancy cases. In addition, we extracted data on HMIS 105 reporting rates.

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Data analysis

Intermittent prevention treatment for malaria in pregnancy utilization was computed using the number of ANC registrants who received at least 3 doses of IPTp-SP3 by the total number of ANC1 attendants. First antenatal care attendance is a proxy indicator, the WHO recommends that ANC1 is the standard denominator used when computing IPTp-SP3 utilization. The assumption made is that all pregnant women who initiate ANC1 will at least attend 3 or more ANC visits by the time they reach term pregnancy for delivery. The midwives have been empowered to provide adequate knowledge and encouragement to women attending ANC 1 such that they are motivated to attended subsequent visits. Malaria in Pregnancy (MIP) was computed as the proportion of pregnant women attending ANC1 who tested positive for malaria. We generated national and regional temporal trends for the period 2017–2022. We compared IPTp-SP3 trends with malaria in pregnancy trends through the 6-year period 2017-2022. We used line graphs to demonstrate the trends and Mann-Kendall test to determine the statistical significance of the trends. Data was analyzed using STATA version 14.

Ethical considerations

The Ministry of Health Uganda provided administrative clearance to conduct this investigation. In addition, we received a non-research determination clearance from the US Centers for Disease Prevention and Control (US CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. § §See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. No informed consent from participants was sought since secondary data was used.

Results

Trend of intermittent prevention treatment utilization for malaria in pregnancy among pregnant women attending antenatal care, Uganda, 2017 – 2022

Intermittent prevention treatment utilization for malaria in pregnancy (IPTp-SP3) by pregnant women attending antenatal care in Uganda during 2017–2022 was 2.5% in 2017 and 50% in 2022. A significant decline in IPTp-SP3 utilization from 57% in 2021 to 50% (p= 0.048) in 2022 was registered. The national target for % IPTp-SP3 utilization was below the 66% target for the 6-year period 2017 through 2022. Malaria in pregnancy (MIP) cases increased from 12% to 22% (p=0.05) during the period 2017-2022 despite a rising trend in % IPTp-SP3 utilization of 2.5-50% (p=0.048) across the annual periods 2017-2022. Additionally, malaria in pregnancy was high in 2017 compared to a low IPTp-SP3 utilization in 2017 (Figure 1).

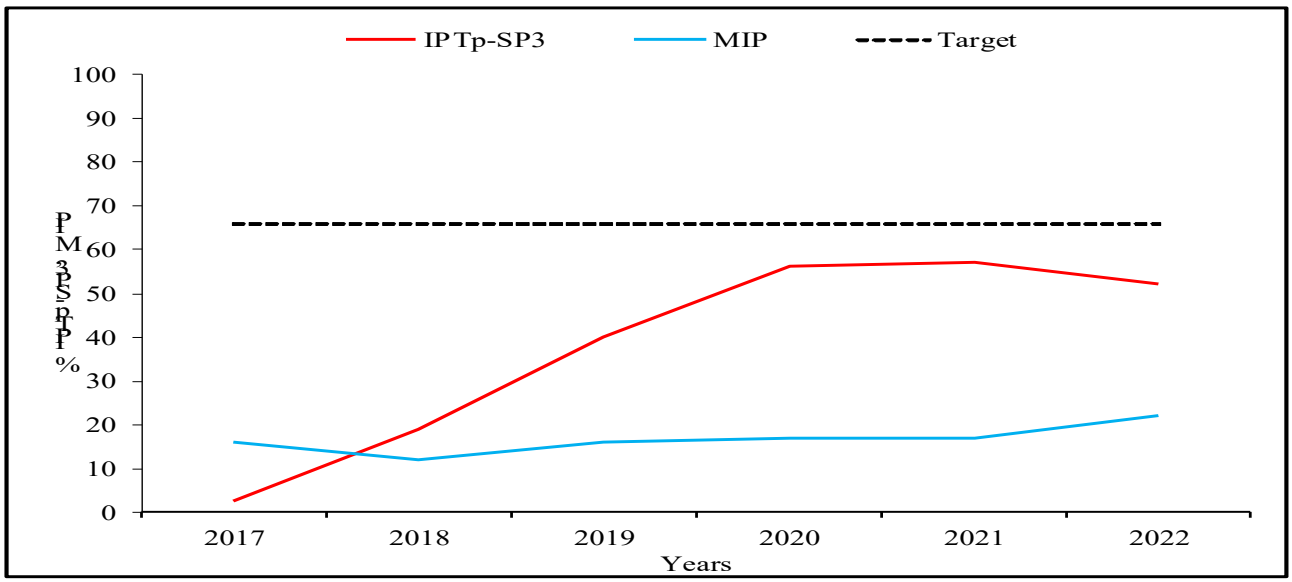

Figure 1: Trend of intermittent prevention treatment for malaria in pregnancy among pregnant women attending antenatal care, Uganda, 2017 – 2022

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Intermittent prevention treatment for malaria in pregnancy utilization by districts, Uganda, 2017-2022

There was an increasing coverage in IPTp-SP3 utilization during 2017-2022, with the districts of Lamwo, Gulu, Adjumani, Obongi, Kasese, and Kamwenge having a consistently high (>66%) IPTp-SP3 utilization during 2020-2022. Districts of Buvuma, Mpigi, Bududa, Kaliro, and Namutumba continued to have a consistently low IPTp-SP3 utilization across the 6-year study period (Figure 2)

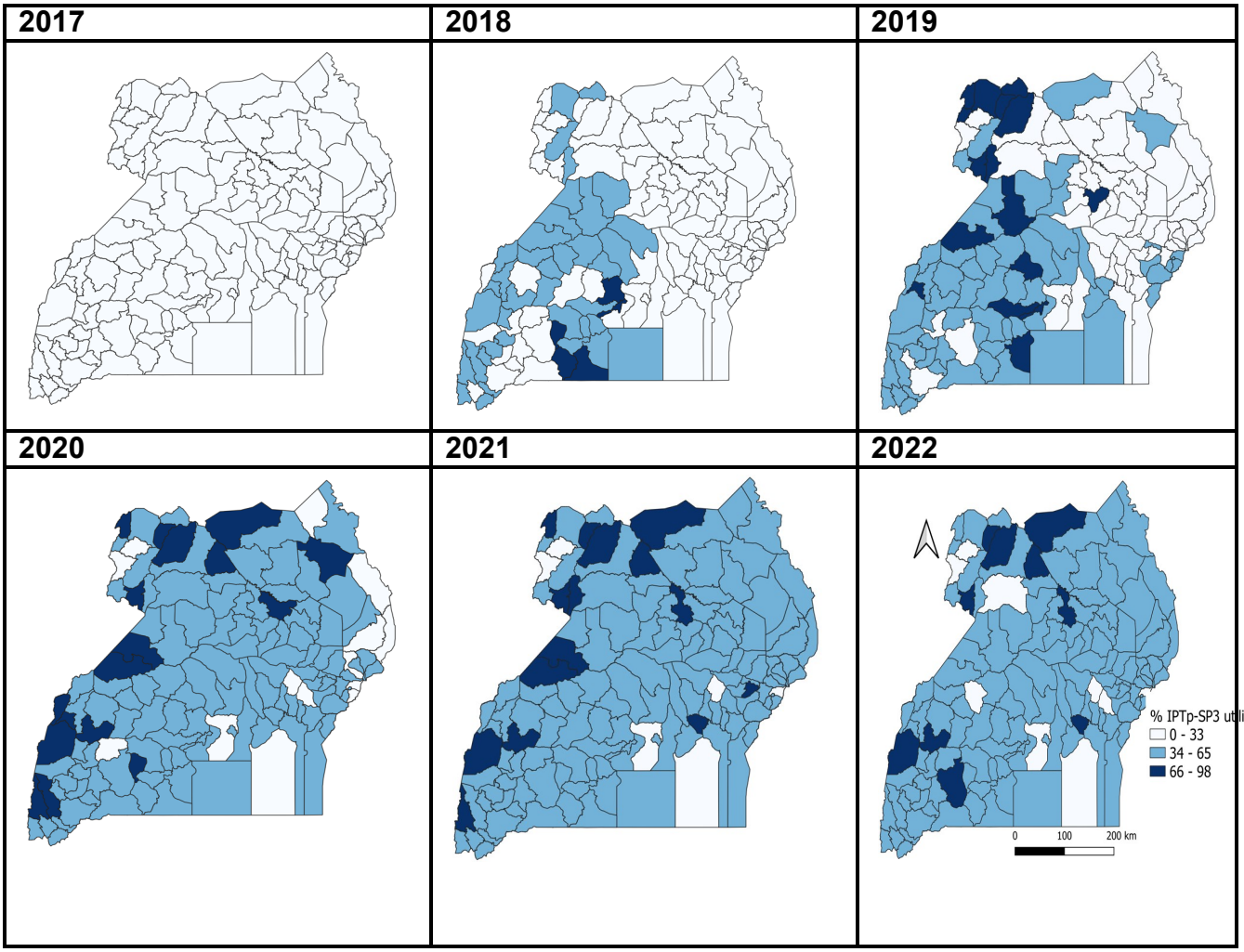

Figure 2: Intermittent preventive treatment for malaria in pregnancy using three doses of sulpa-doxine-pyrimethamine among pregnant women attending antenatal care by districts, Uganda, 2017-2022

Discussion

Despite the overall IPTp-SP3 utilization increasing from 2.5% to 50%, the set target of 66% was not attained. There was an increasing trend in MIP during the 6-year study period. Malaria in pregnancy prevalence was highest in 2017 and 2018, a period when IPTp-SP3 utilization was lowest. Three regions, South Buganda, Karamoja , Bukedi region experienced a decreasing trend in IPTp-SP3 utilization, while two regions Acholi region,Toro region, had an increasing trend in IPTp-SP3 utilization during the period 2017–2022.

Our results indicate a gradual suboptimal improvement in IPTp-SP3 utilization in majority districts from 2017-2022, which supports similar study findings in Ghana, Tanzania (10, 12). This improvement is likely due to adjustments in the policy made by the WHO on antenatal care visits by pregnant women from at least four ANC visits to more than eight ANC visits before giving birth. Having more ANC visits ensures that pregnant women at least initiate three doses of IPTp-SP3 during pregnancy (11). In spite of the observed suboptimal improvements in IPTp-SP3 utilization in majority districts, the overall utilization

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remains insufficient below the recommended 66% national target, and varies greatly by districts.

Districts located in the island (Buvuma and Kalangala) consistently reported low IPTp-SP3 utilization throughout the 6-year period 2017-2022. Our findings are consistent with studies conducted in the African setting with similar malaria endemicity (8, 10, and 11). Although, Basha GW et al (11) argued that challenges of low IPTp-SP3 utilization data seem to revolve around attitudes and perceptions by pregnant women in Ethiopia, this may not be the case in some districts in Uganda. Low IPTp-SP3 utilization might be influenced by contextual factors such as, poor motivation of health workers at the antenatal clinics, challenges with access to the antenatal clinics, cultural practices about medication given during pregnancy, frequent stock outs of drugs used for IPTp-SP3, and inadequate human resource at the health facilities (8, 10). In addition, the COVID-19 pandemic in 2020-2021 affected access of pregnant women to health facilities for antenatal care (21). This finding emphasizes the need for context-specific interventions especially in antenatal clinics. Additionally, there is need to further explore these contextual factors.

We note a small but significant increasing trend in malaria in pregnancy cases during the study period despite a rising trend in % IPTp-SP3 utilization across the period. The increasing trend of malaria cases among pregnant women attending antenatal care as found in the current study is consistent with findings in Malawi, Ghana (16,17). However, our findings contrasts with findings in Kenya (19, 20), where malaria in pregnancy was low in concordance with a high % IPTp-SP3 utilization, possibly due to improved health systems in Kenya where great emphasis is placed on maternal child health indicators (19). The rising malaria in pregnancy cases amidst IPTp-SP3 utilization could be attributed to increasing resistance of malaria parasites to sulfadoxine-pyrimethamine antimalarial. (18). Additionally, our current study did not demonstrate the beneficial effect of higher doses IPTp-SP being able to protect pregnant women against episodes of malaria, possibly because of increasing resistance to sulphadoxine-pyrimethamine, the drug used in IPTp-SP (18).

Study limitations

The study has some limitations that should be considered when interpreting the results. We used secondary data from the District Health Information System 2 (DHIS2), which has challenges of completeness and accuracy, likely leading to either over or under estimation of the IPTp-SP3 utilization among pregnant women and malaria in pregnancy cases.

Conclusion

Utilization of the recommended three or more doses of IPTp-SP remains low. Most pregnant women are less likely to take the recommended three or more doses of IPTp-SP. Malaria in pregnancy cases are still high despite improved IPTp-SP3 utilization.

We recommended further studies to assess the factors associated with low utilization of IPTp-SP3, and resistance patterns to sulphadoxine-pyrimethamine in Uganda.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' Contributions

OD conceptualized the idea, analyzed and interpreted the data and drafted the manuscript. BK, ARA, RM, JN, GR, and HTN critically reviewed the bulletin for intellectual content.

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Descriptive analysis of Rift Valley Fever Outbreaks, Uganda, 2016–2023

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Summary

Background: Rift Valley Fever (RVF) is a mosquito-borne viral zoonosis of public health concern. Several sporadic RVF outbreaks have been reported in Uganda. We described the trends and spatial distribution of RVF outbreaks in Uganda, March 2016–December 2023 to guide programing.
Methods: We analysed RVF surveillance data from the electronic Public Health Emergency Man-

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agement (ePHEM) database, Uganda Ministry of Health (MoH). Using the Integrated Disease Surveillance and Response (IDSR) national technical guidelines, a confirmed RVF case was defined as any patient testing positive for either anti-RVF immunoglobulin M(IgM) Enzyme-Linked Immunosorbent Assay (ELISA) antibodies or Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test. We analysed trends of outbreaks using the Mann-Kendall test and described spatial distribution by region and the cattle corridor district where livestock farming is predominant.
Results: During 2016–2023, a total of 43 RVF outbreaks were reported resulting in 340 cases (116 confirmed), 42 deaths with case fatality rate (CFR) of 12%. There was an increase in number of outbreaks from 2016 – 2023. However, the trend is not significant (p=0.73). Most outbreaks 13/43 (42%) were reported in 2018. RVF outbreaks occurred in all four regions of the country, with the highest number reported in the Western region, 27/43 (63%), followed by the Central region, 12/43 (28%). Sixty percent (26/43) of the outbreaks were reported in the cattle corridor districts. Mbarara 4/43 (9%) and Kiruhura 4/43 (9%) Districts reported the highest number of outbreaks in the cattle corridor. Most outbreaks 29/43 (67%) were reported during the dry season: January and June-August.

Conclusion: Sporadic outbreaks of RVF were reported in Uganda every year from 2016–2023. Strengthening efforts to prevent and control RVF in Uganda could reduce the occurrence of RVF outbreaks, particularly in regions and districts with a high number of RVF outbreaks. We recommended MoH to enhance RVF surveillance throughout the year to understand the true burden of the disease. We additionally recommended further investigations to identify factors contributing to the occurrence of RVF outbreaks in Uganda.

Introduction

Rift Valley fever (RVF) is a zoonotic viral hemorrhagic fever (VHF) caused by the Rift Valley fever virus (RVFV). Humans commonly contract the infection through contact with sick animals or their products. However, transmission of RVFV from animals to humans can also occur through bites from infected mosquitoes (1). According to the International Livestock Research Institute, approximately 70% of Uganda's population is involved in livestock production which increases the risk of transmission of zoonotic diseases from animals to humans. Uganda has experienced several sporadic outbreaks of RVF in both humans and animals. According to the review of RVF on humans and animals, and a report by the Food and Agriculture Organisation (FAO), the disease causes severe illness, and human and animal deaths, and impacts the exportation of livestock and their products from the Horn of Africa where Uganda lies (2, 3).

Rift Valley Fever is among the notifiable diseases that require immediate reporting to the MoH. According to the National Technical Guidelines for Integrated Disease Surveillance and Response (IDSR) in Uganda, RVF is detected using Event Based Surveillance (EBS) which is implemented at community, health facility, district, and national level at the Public Health Emergency Operation Centre (PHEOC). The information on suspected or confirmed RVF is sent immediately within 24 hours to the PHEOC through a national hotline (4).

Despite the prolonged presence of RVF in Uganda, there is inadequate information on the distribution of RVF among humans in the country. We described the trends and spatial distribution of RVF outbreaks among humans, Uganda, 2016–2023 to inform programming.

Methods

Study setting

Uganda is divided in four regions: Western, Eastern, Northern, and Central. These regions are then subdivided into 146 districts. As of 2022, the projected population of Uganda stood at 44,212,800, with an annual growth rate of 3.3% (5). The majority of the households constituting 58%, depend on livestock as a source of livelihood (2). Notably, most of livestock rearing occurs within the cattle corri

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dor districts of Uganda. The country experiences two rainy seasons (March–May and September–December).

Study design and data source

We analysed event-based surveillance data reported through the electronic Public Health Emergency Management (ePHEM) database of the MoH, 2016–2023. As per IDSR guidelines, a confirmed RVF case was as any patient who, after clinical screening, with positive for either anti-RVF immunoglobulin M(IgM) Enzyme-Linked Immunosorbent Assay (ELISA) antibodies or Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test. Any RVF case not linked to another known RVF case was considered an RVF outbreak (6).

Study variables and data abstraction

We abstracted data on number of RVF cases, fatalities, confirmed cases, affected districts, onset and end date of the outbreak, as well as the month and year.

Data management and analysis

We conducted a descriptive analysis of RVF outbreaks by time and place using Microsoft Excel 2019. We conducted univariate analysis to obtain frequencies and proportions of outbreaks, cases, deaths, districts affected, and regions affected. We calculated the Case Fatality Rate (CFR) as the proportion of people who died from RVF among all individuals diagnosed with RVF over a certain period of time (2016-2023). We used Quantum Geographic Information System (QGIS) version 3.22 to generate maps to show the distribution of RVF outbreaks.

Ethical considerations

The Ministry of Health Uganda provided administrative clearance to conduct this investigation. In addition, we received a non-research determination clearance from the US Centers for Disease Prevention and Control (US CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. § §See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. No informed consent from participants was sought since secondary data was used.

Results

Rift valley fever outbreaks, Uganda, 2016–2023

During 2016–2023, a total of 43 RVF outbreaks were reported through the EBS system, ePHEM with an average of five outbreaks annually. These outbreaks resulted in 340 reported cases averaging 43 cases each year, with an average of 7.9 cases per outbreak. Over the study period, 42 deaths (average of five deaths annually), yielding a CFR, of 12.4%. Of the 340 cases, 116 (34.1%) were confirmed. On average, RVF outbreaks lasted for 72 days (10 weeks) with a range of 24–127 days from the time of reporting to the public health facilities to the time when the response was completed.

Rift Valley Fever outbreaks have been reported across all regions in Uganda. Western region reported the highest number of RVF outbreaks (27/43, 63%), cases (302/340, 89%) and deaths (31/42, 73.8%) with CFR of 10%, followed by Central Uganda which reported 12 outbreaks, 34 cases and 9 deaths with CFR of 27%. Eastern Uganda reported the least number of outbreaks, with no recorded deaths (Table 1). However, there was no significant difference in the number of outbreaks by region (p=0.213).

Table 1: Percentage of rift valley fever outbreaks, cases, and deaths by region, Uganda, 2016-2023

Region	Outbreaks		Cases		Deaths		CFR %
	Number	%	Number	%	Number	%	
Western	27	63	302	89	31	73.8	10
Central	12	28	34	10	9	21.4	27
Northern	3	7	3	0.9	2	4.8	67
Eastern	1	2	1	0.3	0	0	0
Total	43	100	340	100	42	100	12

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Rift valley fever outbreaks and cases by year, Uganda, 2016–2023

The number of outbreaks reported per year ranged from 1 in 2016 to 13 in 2018 (Figure 1). The average number of RVF outbreaks was 5.4 outbreaks per year. The highest number of RVF outbreaks was reported in 2018 (n=13, 30.2%), followed by 2023 (n=8, 18.6%). The least number of RVF outbreaks were reported in 2016 (n=1, 2.3%).

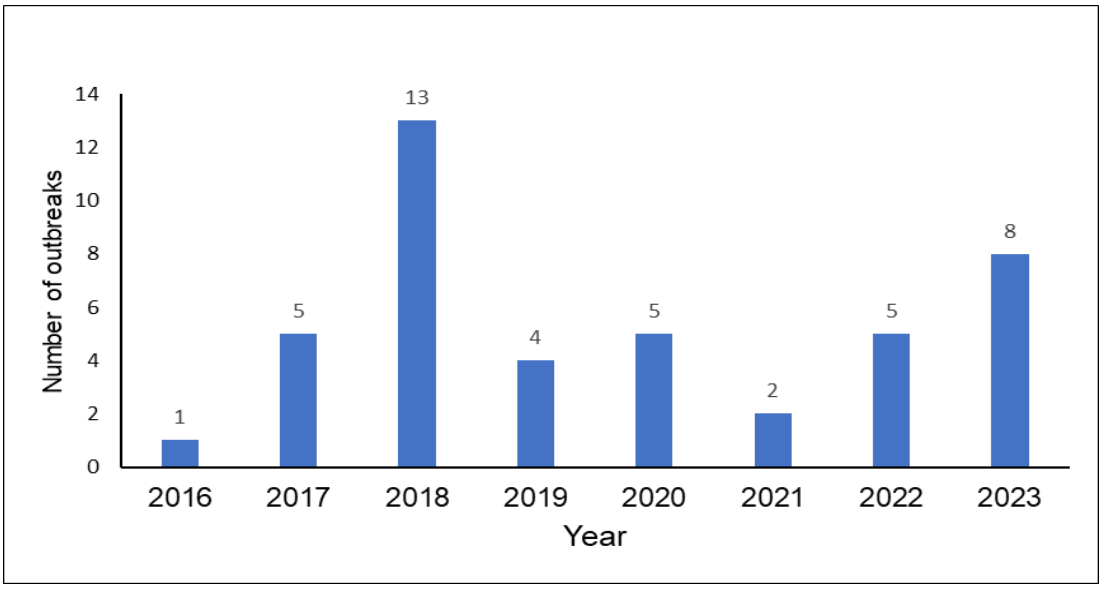

Figure 1:Rift valley fever outbreaks by year, Uganda, 2016–2023

Rift valley fever cases and deaths during rift valley fever outbreaks, Uganda, 2016–2023

The highest number of RVF cases were reported in 2023 (n=182, 53.5%), followed by 2022 (n=41, 12.1%). The highest number of deaths were reported in 2023 (n=13, 31%) and 2018 (n=13, 31%). The highest number of deaths were reported in 2018 and 2023 (Figure 2).

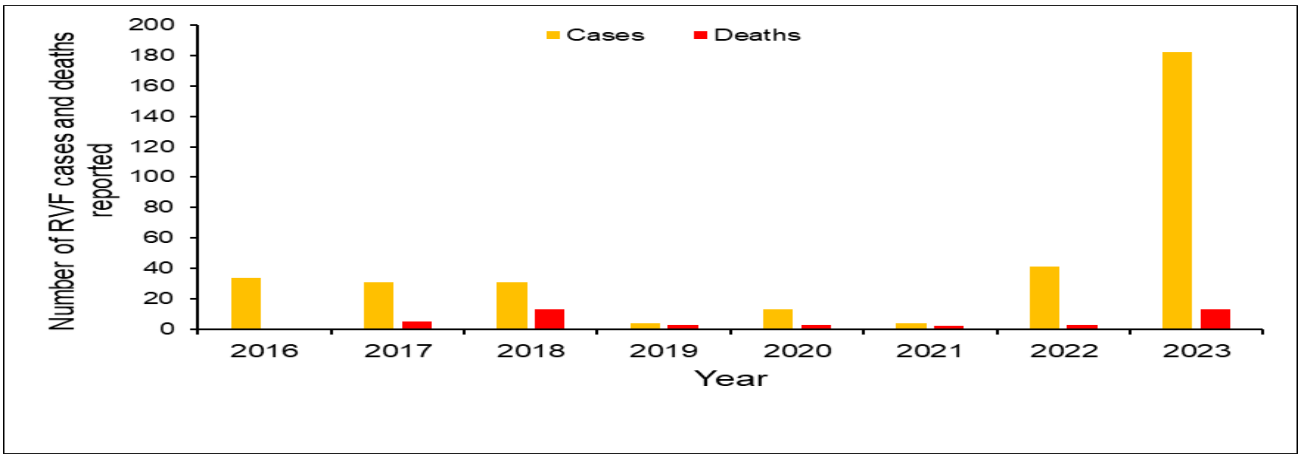

Figure 2: Rift valley fever cases and deaths during Rift Valley Fever outbreaks, Uganda, 2016–2023

Monthly distribution of rift valley fever outbreaks, Uganda, 2016–2023

The majority (29/43) of RVF outbreaks were reported in the dry season (June–August and January–February) compared to the rainy season (March–May and September–December). The highest number of outbreaks were reported between June and August. From 2016– 2023, most outbreaks were reported in July (8/43, 19%). No outbreaks were reported in April and September over a period of 8 years. In 2018, most outbreaks were reported in July (n=5), followed by June (n=3), and August (n=3). In 2017, most RVF outbreaks were reported in November (n=3) and December (n=2). In 2023, most outbreaks were reported in January (Figure 3).

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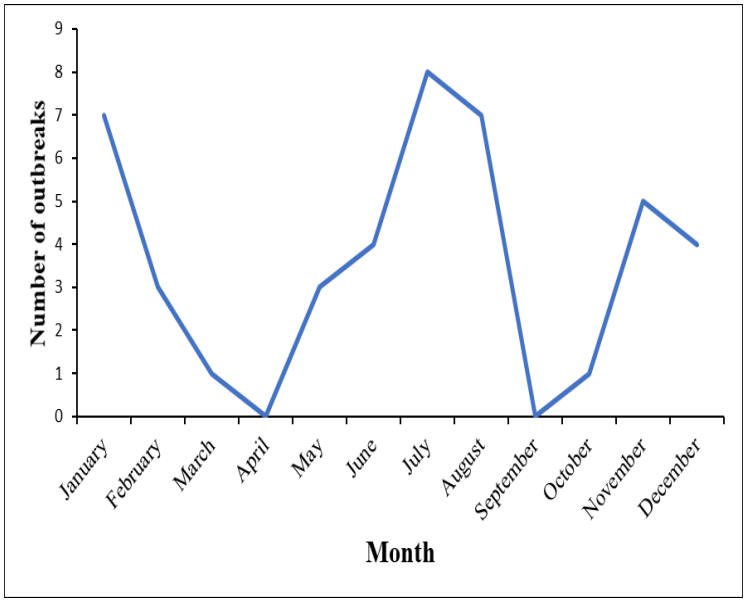

Figure 3: Rift valley fever outbreaks by month through, Uganda, 2016–2023

Spatial distribution of rift valley fever cases and outbreaks, Uganda, January 2016–2023

Out of 146 districts, 29 (19.9%) reported at least an outbreak of RVF affecting humans between 2016–2023 (Figure 4). Most of these outbreaks were reported in Mbarara (n=4, 13.8%), and Kiruhura (n=4, 13.8%), followed by Isingiro (n=3, 10.3%) and Kabale (n=3, 10.3%) districts. The highest number of RVF cases were reported in Mbarara (n=127, 37.4%) and Kabale districts (n=49, 14.4%) . Most outbreaks (60%) were reported in the cattle corridor districts (Figure 4).

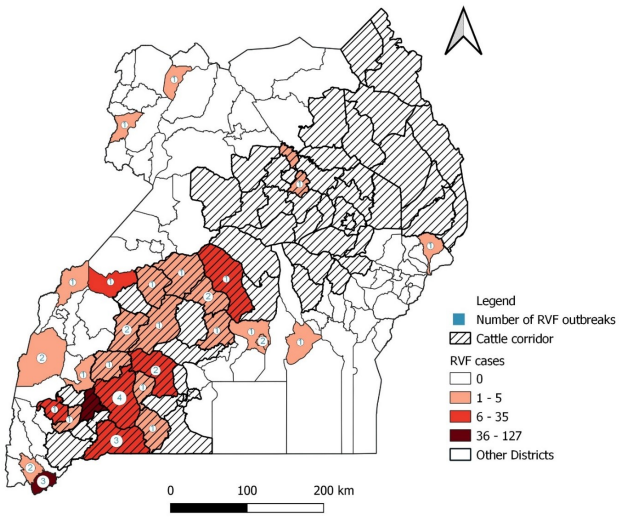

Figure 4: Rift valley fever outbreaks and cases, Uganda, 2016–2023

Discussion

We found that a total of 43 outbreaks were reported from 2016–2023 resulting in 340 cases and 42 deaths. RVF outbreaks occurred in all four regions of the country, with the highest number reported in the Western region. Sixty percent of the outbreaks were reported in the cattle corridor districts.

Since 2016, Uganda has grappled with sporadic outbreaks of RVF. Between 2016–2023, 43 RVF outbreaks involving 340 individuals were reported. The number of outbreaks and cases were likely underestimated due to under-reporting; because RVF often manifests with either as mild or asymptomatic constraining its diagnosis (1). The disease is often misdiagnosed with other endemic diseases such as malaria. Moreover, RVF commonly affects individuals residing in rural areas where health centers may be far (7). Given that the definitive diagnosis for RVFV can only be achieved through laboratory, there is an urgent need to build the capacity of regional laboratories to test for RVF.

The RVF outbreaks were reported in all regions of Uganda across the study period, potentially attributed to animal movements during trade (7). Notably, the Western and Central regions reported high numbers of RVF cases and outbreaks. This finding is consistent with a study conducted in 2023 that utilized national seroprevalence data from cattle, goats, and sheep to map the risk of RVF in Uganda (8). The Western region and the cattle corridor districts emerged as hotspots for RVF outbreaks and cases. Particularly, Mbarara and Kiruhura districts stood out for reporting the highest number of RVF outbreaks. This trend could be attributed to the predominant livestock farming in the cattle corridor stretching across South-Western Uganda where Mbarara and Kiruhura lies (2). Consequently, increased livestock-human interaction contributes to the transmission of RVFV from animals to humans.

The majority of the outbreaks occurred following the dry season and end-of-year festive season, this could be as a result of increased slaughter and trade in animal and animal products (7). The increase in outbreaks during the festive season indicates a possible increase in human activities, including slaughter and trade of animals and animal products. This heightened activity may contribute to the transmission of the RVF virus from animals to humans. These findings highlight the need for targeted interventions during specific times of the year to effectively control and prevent RVF outbreaks, safeguarding both animal and human health.

The highest number of outbreaks were reported in

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2018 and January 2023. This could be explained by the enhanced surveillance during the Ebola virus disease (EVD) outbreak that occurred in 2018 in the Democratic Republic of Congo and the 2022 –2023 EVD outbreak that occurred in Uganda, leading to a high index of suspicion of RVF (9)

The study found a higher overall CFR of 12.4%. This is higher than that <1% documented by the World Health Organisation (1). This could be attributed to the under-detection of RVF cases since the majority of the RVF case-patients may present with no or mild symptoms. The high CFR could be because only the patients with severe RVF disease present to health facilities and are detected late by the disease surveillance system (10).The majority of the patients presenting with mild symptoms may then remain undetected by the surveillance system. The high case fatality rate could also be attributed to the late detection of RVF cases which is as a result of low suspicion index among clinicians. The disease is suspected by some clinicians when the patients start to experience hemorrhagic signs which are usually present in the terminal stages of the severe disease (11).

Study limitations

This study had some limitations. First, the outbreaks whose data we analysed primarily focused on reported RVF cases by the health facilities. the symptoms of RVF mimic many other endemic infections in Uganda such as malaria and other arboviral fevers. As a result, human cases are diagnosed and observed only late during outbreaks or not diagnosed at all. These factors contribute to reporting bias likely leading to an underestimation of the magnitude of RVF during the study period. Secondly, we used secondary data associated with missing data on several variables hence limited on a detailed exploration of the RVF outbreaks/cases during the reporting period.

Conclusion

Uganda has experienced increasing sporadic outbreaks of RVF since March 2016. Strengthening efforts to prevent and control RVF in Uganda could reduce the occurrence of RVF outbreaks, particularly in regions and districts with the high number of RVF outbreaks. We recommend MoH to enhance RVF surveillance throughout the year to understand the true burden of the disease. We further recommended investigations to identify factors contributing to the occurrence of RVF outbreaks in Uganda. By addressing the shortfalls reported in this study, Uganda can strengthen its preparedness and response mechanisms to better combat the threat of RVF.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors contribution

All authors contributed to the write-up and review of the bulletin. MK wrote the drafts of the bulletin and revised the paper for substantial intellectual content. BK, RM, DM, SL,, IK, and ARA reviewed the paper for substantial intellectual content. MK and JK participated in the abstracting of the secondary data. All the authors read and approved the final version of the bulletin.

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Pre-exposure prophylaxis initiation and its associated factors among Adolescent Girls and Young Women in Uganda, 2017–2022

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Summary

Background: Adolescent girls and young women (AGYW) aged 15-24 years are disproportionately affected by HIV, accounting for 28% of new HIV infections in Uganda. Oral pre-exposure prophylaxis (PrEP) is highly effective in reducing the risk of HIV acquisition for people at risk including AGYW. We describe oral PrEP initiation and associated factors among AGYW, Uganda, 2017−2022.

Methods: We analyzed nationwide PrEP data among AGYW reported through the PrEP tracker, an electronic Ministry of Health data management tool. We abstracted data on HIV testing, the PrEP cascade (screening, eligibility, and initiation), reasons for declining PrEP, and factors associated with PrEP initiation. We summarized the data for the various PrEP cascade indicators as frequencies and proportions. We used modified Poisson regression to determine factors associated with PrEP initiation.
Results: A total of 64,363 observations of AGYW were obtained of which 63,608 (98.8%) AGYW were tested for HIV and 57,059 (89.7%) tested HIV-negative. Of the HIV-negative, 47,978 (84.1%) were screened for PrEP eligibility and 36,261 (75.6%) were eligible. Out of the eligible group, 32,258 (89.0%) initiated PrEP of which 19,379 (60.1%) were aged 20-24 years. The proportion who initiated PrEP increased from 54% in 2017 to 94% in 2022. More than half (53%) of the AGYW who never initiated PrEP attributed it to disliking daily medication. Being between 20-24 years (*a*PR:1.20; 95% CI: 1.02,1.29), having a casual sexual partner vs. single (*a*PR:1.20; 95% CI: 1.12-1.29), being tested through outreach (*a*OR:2.17 95% CI: 2.09-2.25) or at workplace (*a*PR:1.85; 95% CI: 1.68-2.03) vs. outpatient department were associated with increased likelihoods of initiating PrEP.
Conclusion: PrEP initiation was high among eligible AGYW. Dislike of daily medication was the main reason for declining PrEP, suggesting alternative PrEP regimens such as long acting cabotegravir and the dapivirine ring might result in greater PrEP initiation among eligible AGYW. In addition, reaching AGYW through outreaches or workplaces was associated with increased likelihood of PrEP initiation, suggesting strengthening of differentiated service delivery models that are adaptive to client needs and lessen access barriers.

Background

Despite progress towards ending HIV/AIDS as a public health threat in the last 20 years, there were still 1.5million new HIV infections globally in 2021 (1). The global HIV disease burden is disproportionately concentrated in Sub Saharan Africa (SSA); despite only containing one quarter of the world's population(2). In 2017, SSA represented 65% of all new HIV infections (2).

Although Uganda has a generalized HIV epidemic, certain sub-populations, including Adolescent Girls and Young Women (AGYW) aged 15-24 years, continue to be at higher risk of HIV acquisition compared to the general population. In 2020, the preva-

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lence of HIV among AGYW was 2.9% compared to 0.8% among adolescent boys and young men (ABYM)(3). Additionally, an estimated 54,000 new infections were recorded in Uganda during 2022, with approximately 37% occurring in young people aged 15-24 years of which nearly 75% happened to be AGYW (4, 5).

The high HIV risk in AGYW is attributed to a number of factors including but not limited to harmful cultural and gender norms, gender-based violence, poverty, high school drop- out rates, early marriages, and sexual intercourse with much older males (6). Furthermore, the COVID-19 pandemic is thought to have exacerbated the HIV risk for AGYW in Uganda due to the two years of school closure in the country, which happened to be the longest globally (7).

Changing the tide against HIV requires concerted efforts in large-scale implementation of effective HIV prevention interventions such as Pre- Exposure Prophylaxis (PrEP). Pre- Exposure Prophylaxis is an evidence-based HIV prevention intervention that reduces the risk of HIV acquisition by over 90% if used consistently and correctly (8). Oral PrEP is taken as a once daily combination pill of Tenofovir disoproxil fumarate and emtricitabine or Tenofovir disoproxil fumarate and Lamivudine (TDF + FTC or TDF + 3TC) as long as one is at substantial risk of HIV acquisition.

In Uganda, PrEP implementation started in July 2017 at six sites in four districts (9). By the end of 2022, PrEP was being provided at 587 sites in over 65 districts (10). At the time of rolling out PrEP implementation, the target population was men who have sex with men and female sex workers. Adolescent girls and young women were included to the target population for PrEP in the President's Emergency Plan for AIDS Relief (PEPFAR) fiscal year October 2020–September 2021 (COP20).

Despite the scale-up of PrEP, initiation and continuation among AGYW has remained sub-optimal. According to unpublished PEPFAR Uganda Program data, 19,025 AGYW were initiated on PrEP in fiscal year 22 against a target of 70,196, representing only 27% of the target. Several barriers limit optimal PrEP use in AGYW including fear of side effects, intimate partner violence, low perceived risk, stigma associated with PrEP packaging, low family support, unfriendly and judgmental health workers, and inability to take daily pills among others (11).

According to studies conducted in Kenya, low and middle income countries, PrEP initiation among AGYW was dependent on a number of factors including but not limited to age, access to PrEP, knowledge about PrEP, one's perception of their HIV risk, side effects, pill burden, support from peers, mode of delivery, doubts about PrEP efficacy, alcohol use, social support, social norms, fear of guardians reactions, and one's attitude towards condoms use (12-15).

Although several periodic assessments have been done on PrEP initiation and continuation, little is known about PrEP initiation and its associated factors among AGYW (16, 17). Understanding the initiation of PrEP and its associated factors among AGYW is critical in guiding the design of tailored PrEP interventions and strategies. Additionally, it may help to high light regions that required inserted efforts to increase PrEP initiation among AGYW. We described PrEP initiation and its associated factors among AGYW in Uganda, 2017–2022.

Methods

Study setting

We considered PrEP data generated in the entire country. As of end of 2022, Uganda had approximately 6,937 health facilities, of which 587 provided PrEP (18, 19). According to the Uganda Bureau of Statistics Population Projection for 2022, the population of AGYW in Uganda was estimated at 4,808,700 (20).

Study design and data source

We analyzed PrEP data among high-risk AGYW aged 15-24 years reported through the PrEP tracker from 2017–2022. Adolescent girls and young women were added to the list of populations targeted for PrEP in Uganda in 2020. From 2017−2019, AGYW had access to PrEP but were not prioritized. The PrEP tracker is an electronic database that contains nationwide data for key and priority populations including high-risk AGYW. All health facilities that provide PrEP services are mandated to report data on a quarterly basis.

For AGYW to be initiated on PrEP, they must be eligible. Eligibility for PrEP includes one being HIV

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negative and is at substantial risk of acquiring HIV. Substantial risk of acquiring HIV includes the following: those with multiple sex partners of unknown HIV status, recurrent use of post exposure prophylaxis, and having at least one episode of a sexually transmitted infection monthly.

Pre-exposure prophylaxis data reported in the PrEP tracker include: total clients, total clients tested for HIV, total clients screened for PrEP eligibility and risk assessment, total clients eligible for PrEP, and total clients that Sero-converted.

Study variables, data collection, data management and analysis

Nationwide AGYW PrEP data was abstracted from the PrEP tracker. The data abstracted included: number of clients tested for HIV, total clients screened for PrEP eligibility, total clients eligible for PrEP and total clients initiated on PrEP, disaggregated by age (15-19, 20-24), from 2017–2022. We also obtained data on health facility and district/region.

The data was first downloaded in excel format and checked for completeness. The abstracted data was coded and imported into STATA SE version 14 for analysis. We summarized the data for the various PrEP cascade indicators (total AGYW, HIV testing, PrEP screening, PrEP eligibility, initiated on PrEP) as frequencies and proportions. Trends of PrEP initiation across the years were summarized as proportions and Mann-Kendal was used to determine significance of the trends. Choropleth maps were drawn using Quantum Geographic Information System (QGIS) to show the distribution of AGYW initiated on PrEP for the years 2017–2022.

We used modified poison regression to identify factors associated with PrEP initiation.

Ethical considerations

Since our study used routine surveillance data reported by health facilities in the PrEP tracker, we sort for permission from Monitoring and Evaluation Technical Support (METS). US Centers for Disease Control and Prevention (CDC) provided the non-research determination (NRD) for non-human subjects. In agreement with the International Guidelines for Ethical Review of Epidemiological Studies by the Council for International Organizations of Medical Sciences (1991) and the Office of the Associate Director for Science, US CDC/Uganda, it was determined that this activity was not human subject research and that its primary intent was public health practice or disease control activity (specifically, epidemic or endemic disease control activity). This activity was reviewed by the US CDC and was conducted consistent with applicable federal law and CDC policy. §§See, e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. All experimental protocols were approved by the US CDC human subjects review board (The National Institute for Occupational Safety and Health Institutional Review Board) and the Uganda Ministry of Health and were performed in accordance with the Declaration of Helsinki

Results

Pre-exposure prophylaxis cascade of adolescent girls and young women, Uganda, 2017–2022

Of the 64,363 AGYW aged 15-24, 63,608 (98.8%) were tested for HIV, of which 57,059 (89.7%) tested HIV negative. Of those that tested HIV-negative, 47,978 (84.1%) were screened for PrEP eligibility, of which 36,261 (75.6%) were eligible for PrEP. Of those eligible, 32,258 (89.0%) were initiated on PrEP over the six-year period (Figure 1).

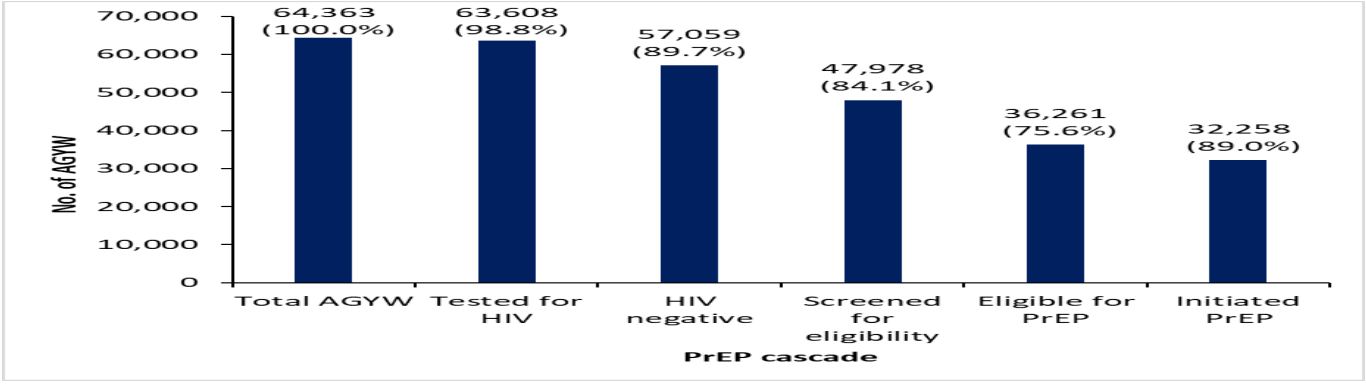

Figure 1: Pre-exposure prophylaxis cascade of adolescent girls and young women in Uganda, 2017–2022

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Demographic characteristics of adolescent girls and young women initiated on pre-exposure prophylaxis in Uganda, 2017–2022

A total of 64,363 records of AGYW were abstracted and 32,258 initiated PrEP. Of those that initiated PrEP, 60% were aged 20-24 years, nearly three quarters (74.5%) were single, nearly half of them (49.8%) had primary education and over 80% of them were reached through outreach (Table 1).

Table 1: Baseline characteristics of adolescent girls and young women initiated on preexposure prophylaxis in Uganda, 2017–2022

Characteristics	Frequency (n=32,258)	Percent
Age group		
15-19	12,879	40.0
20-24	19,379	60.0
Marital status*		
Single	19,191	74.5
Married	5,178	20.1
Divorced	975	3.8
Regular partner	43	0.2
Causal	340	1.3
Widowed	23	0.1
Educational level†		
No formal education	3,013	14.9
Primary	10,093	49.8
Secondary	6,766	33.4
Tertiary	391	1.4
Nationality‡		
National	22,883	99.8
Foreigner	3	0.01
Refugee	44	0.2
Point of entry§		
OPD	3,329	14.6
ACASI	28	0.1
ART clinic	76	0.3
Homebased HTC	39	0.2
MCH	383	1.7
Outreach	18,277	80.1
PMTCT	314	1.1
Workplace	323	1.4
Others	40	0.2
Region¶		
Acholi	2,045	6.3
Ankole	1,092	3.4
Bugisu	662	2.1
Bukedi	425	1.3
Bunyoro	1,369	4.3
Busoga	858	2.7
Kampala	7,517	23.3
Karamoja	0	0.0
Kigezi	299	0.9
Lango	5,398	16.8
North Central	5,302	16.5
South Central	6,204	19.25
Teso	28	0.1
Tooro	901	2.8
West Nile	133	0.4

*representing an n of 25,750, †representing an n=20,263, ‡ representing an n=22,930, § representing n=22,809, ¶representing n =32,233

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Trend of adolescent girls and young women initiated on pre-exposure prophylaxis over the years in Uganda, 2017–2022

Overall, the proportion of AGYW who initiated PrEP across the years increased from 54% in 2017 to 94% in 2022 but the increase was not significant (*p=0.13*) (Figure 2).

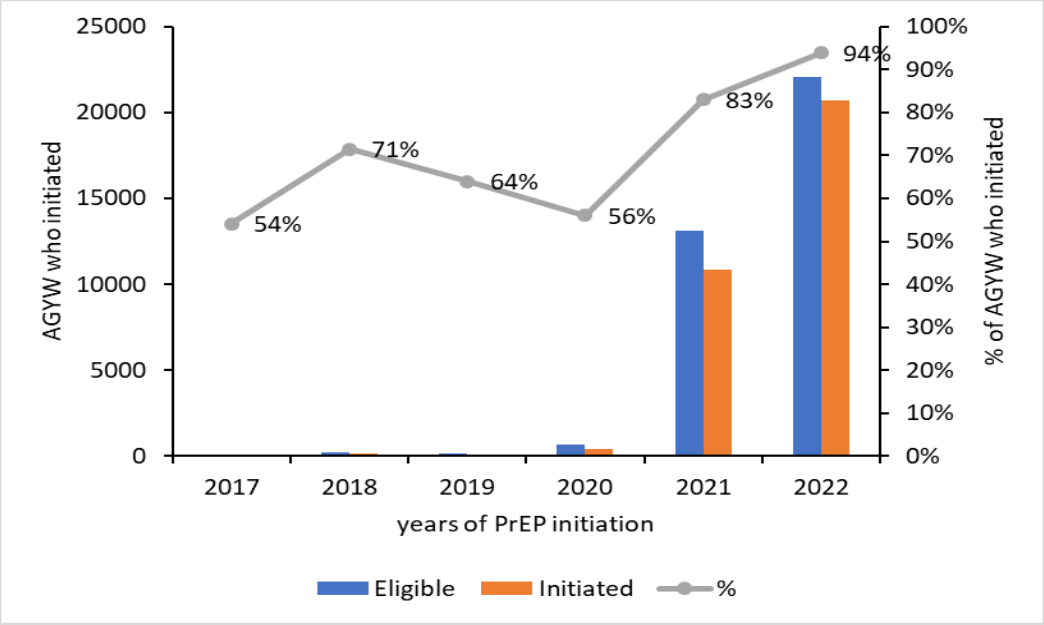

Figure 2: Proportion of adolescent girls and young women initiated on pre-exposure prophylaxis in Uganda, 2017–2022

Distribution of proportion of adolescent girls and young women initiated on pre-exposure prophylaxis per region, Uganda, 2020–2022

Across the years, the proportion of AGYW initiated on PrEP per region increased as shown (Figure 4). In 2022, Kampala region had the highest proportion of high-risk AGYW initiated on PrEP (Figure 3).

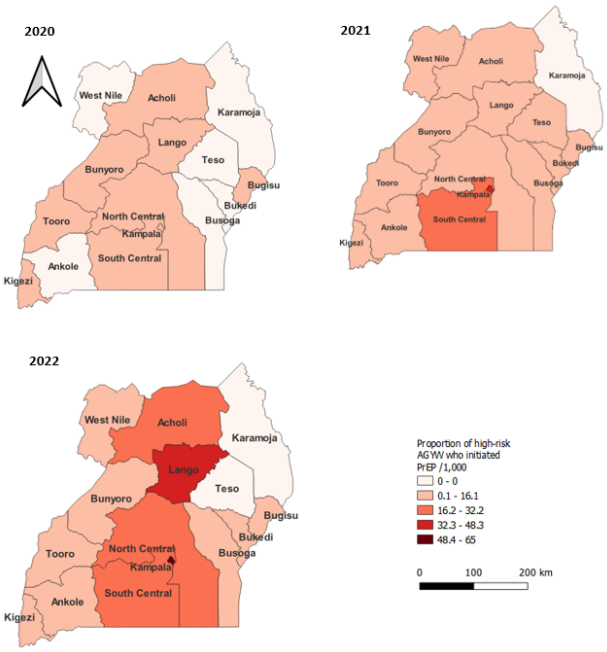

Figure 3: Spatial distribution of Adolescent Girls and Young Women who initiated pre-exposure prophylaxis, Uganda, 2020–2022

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Factors associated with pre-exposure prophylaxis Initiation among adolescent girls and young women, Uganda, 2017–2022

At bivariate analysis, age group, marital status, educational level, point of entry and region were associated with PrEP initiation (Table 3).

At multi-variate analysis, being aged 20-24 (*a*PR:1.04; 95% CI: 1.02-1.29), having a casual partner (*a*PR=1.20; 95% CI: 1.12, 1.29), being reached through outreach (*a*PR:2.17; 95% CI: 2.09-2.25) and work place (*a*PR:1.85; 95% CI: 1.68-2.03) were associated with an increased likelihood of PrEP initiation. On the other hand, having secondary education (*a*PR:0.92; 95% CI: 0.90-0.95), tertiary education (*a*PR:0.73; 95% CI: 0.67-0.79), accessing services at PMTCT (*a*PR:0.57 95% CI: 0.48-0.68) and being in a region other than Bugisu and Teso were associated with a reduced likelihood of initiating PrEP (Table 2).

Table 2: Factors associated with pre-exposure prophylaxis initiation among adolescent girls and young women, Uganda, 2017–2022

Characteristic	PrEP initiation	PrEP initiation	Unadjusted PR (95% CI)	Adjusted PR (95% CI)
	Yes (%)	No (%)		
Age group				
15-19	12,879 (40.0)	13,263 (41.3)	1	1
20-24	19,379 (60.1)	18,842 (58.7)	1.56 (1.03, 1.77)	1.04 (1.02, 1.06)
Marital status				
Single	19,191(74.5)	18,093 (71.6)	1	1
Married	5,178 (27.0)	6,048 (23.9)	0.97 (0.95, 0.99)	0.99 (0.68, 1.10)
Divorced	975 (3.8)	757 (3.0)	1.17 (1.13, 1.21)	1.00 (0.96, 1.05)
Regular partner	43 (0.2)	158 (0.6)	0.51 (0.40, 0.65)	0.75 (0.61, 1.05)
Causal sexual partner	340 (1.3)	192 (0.8)	1.23 (1.17, 1.30)	1.20 (1.12, 1.29)
Widowed	23 (0.1)	20 (0.1)	2.10 (0.85, 1.36)	1.10 (0.86, 1.40)
Educational level				
No formal education	3,013 (14.9)	2,863 (16.6)	1	1
Primary	10,093 (49.8)	7,036 (40.8)	1.14 (1.12, 1.17)	0.98 (0.96, 1.01)
Secondary	6,766 (33.4)	6,641 (38.5)	1.32 (1.00, 1.06)	0.92 (0.90, 0.95)
Tertiary	391 (1.9)	710 (4.1)	0.91 (0.85, 0.98)	0.73 (0.67, 0.79)
Region				
Acholi	2,045 (6.3)	206 (0.7)	1	1
Ankole	1,092 (3.4)	2,449 (8.7)	0.37 (0.36, 0.39)	0.52 (0.96, 1.01)
Bugisu	662 (2.1)	83 (0.3)	0.97 (0.94, 0.99)	0.97 (0.93, 1.01)
Bukedi	425 (1.3)	427 (1.5)	0.61 (0.57, 0.65)	0.55 (0.50, 0.60)
Bunyoro	1,369 (4.2)	903 (3.2)	0.78 (0.76, 0.81)	0.72 (0.69, 0.75)
Busoga	858 (2.7)	1,206 (4.3)	0.59 (0.56, 0.62)	0.52 (0.46, 0.57)
Kampala	7,517 (23.3)	7,771 (27.6)	0.73 (0.72, 0.74)	0.67 (0.65, 0.68)
Kigezi	299 (0.9)	260 (0.9)	0.61 (0.57, 0.66)	0.59 (0.49, 0.72)
Lango	5,398 (16.7)	240 (0.9)	1.04 (1.03, 1.05)	0.94 (0.92, 0.96)
North Central	5,302 (16.4)	4,645 (16.5)	0.73 (0.72, 0.74)	0.81 (0.78, 0.84)
South Central	6,204 (19.2)	4,234 (15.1)	0.75 (0.74, 0.76)	0.72 (0.70, 0.74)
Teso	28 (0.1)	6 (0.02)	0.92 (0.79, 1.06)	0.61 (0.83, 1.09)
Tooro	901 (2.8)	3,058 (10.9)	0.35 (0.34, 0.37)	0.30 (0.28, 0.34)
West Nile	133 (0.4)	2,623 (9.3)	0.07 (0.06, 0.08)	0.06 (0.05, 0.08)
Point of entry				
OPD	3,329 (14.6)	11,009 (44.5)	1	1
ACASI	28 (0.1)	41 (0.2)	1.36 (1.05, 1.77)	1.38 (0.97, 1.96)
ART clinic	76 (0.3)	382 (1.5)	0.82 (0.68, 0.99)	0.61 (0.80, 1.38)
Home based HTC	39 (0.2)	225 (0.9)	0.42 (0.31, 0.56)	1.15 (0.71, 1.86)
MCH	383 (1.7)	1,307 (5.3)	0.88 (0.81, 0.96)	1.02 (0.91, 1.01)
Outreach	18,277 (80.1)	10,089 (40.8)	1.92 (1.86, 0.96)	2.17 (2.09, 2.25)
PMTCT	314 (1.4)	1,414 (5.7)	0.70 (0.63, 0.77)	0.57 (0.48, 0.68)
Workplace	323 (1.4)	232 (0.9)	1.94 (1.83, 2.07)	1.85 (1.68, 2.03)
Others	40 (0.2)	46 (0.2)	1.65 (1.36, 2.00)	1.59 (1.20, 2.10)

**aPR=adjusted prevalence ratio, uPR: unadjusted prevalence ratio, ACASI: Audio-computer assisted self-interview, PMTCT: Prevention of Mother to Child Transmission of HIV, MCH: Maternal and Child Health*

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Reasons for declining pre-exposure prophylaxis among adolescent girls and young women, Uganda, 2017–2022

Of the 4,003 AGYW who didn't initiate PrEP, 656 (14.1%) reported reasons for declining PrEP. The main two reasons for declining PrEP were inability to take daily medication (53%) and no need for PrEP (29%) (Figure 4).

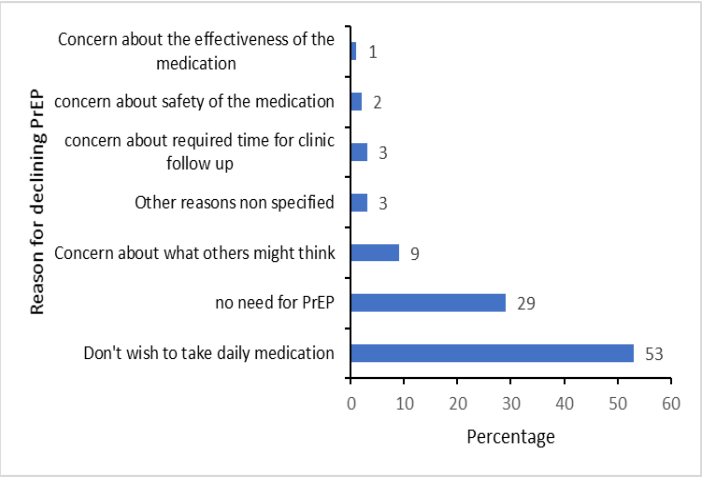

Figure 4: Reasons for declining pre-exposure prophylaxis among Adolescent Girls and Young Women in Uganda, 2017-2022.

Discussion

In this study, we have described PrEP initiation and its associated factors among AGYW in Uganda from 2017–2022. Over the years PrEP initiation and the regions offering PrEP increased. More than half of the AGYW initiated on PrEP were aged 20-24 years. In addition, being aged 20-24 years, being reached through outreaches, and workplaces were associated with an increased likelihood of PrEP initiation. On the other hand, being reached through PMTCT, having secondary or tertiary education, and being in a region other than Bugisu or Teso was associated with a reduced likelihood of initiating PrEP. A few of the eligible AGYW declined PrEP.

HIV testing is a critical entry step into HIV prevention and treatment programs. HIV testing for AGYW was very high. This could be attributed to a favorable ministry of health policy that lowered consent age for HIV testing from 18 to 12 years (21). In addition, the increasing PEPFAR HIV testing targets over the years contributes to improved screening and testing(22).

Majority of the HIV negative AGYW were screened for PrEP eligibility. Although this may be high, it also presents missed opportunities in not screening a significant number of AGYW. The non-screened AGYW had been found eligible for HIV testing which implies that they had at least one factor putting them at risk of HIV acquisition. The proportion of AGYW eligible for PrEP was even lower. This could be attributed to the rigorous PrEP eligibility screening process which may screen out some clients. Overall, PrEP initiation was high. This could be attributed to good health education, counselling, and strong peer support systems. Similar findings were noted in a study conducted in both South Africa and Kenya where AGYW reported that receiving both clear and comprehensive information on PrEP enriched their knowledge on the same thus interesting them to initiate PrEP (23). In addition, AGYW in Kenya reported peer support helped to normalize PrEP use and reduced stigma as they influenced their understanding of PrEP and its initiation (13).

Over the years PrEP initiation increased. This could be attributed to improved health worker capacity to offer PrEP, increased number of sites offering PrEP, and the increasing PEPFAR PrEP targets year after year. The increased targets usually come with increased resources which translates into improved performance(22). The deep in 2019 and 2020 could be attributed to travel restrictions implemented by government to curtail the spread of COVID-19 and this could have been before the program adaptations to ensure un-interrupted service provision took effect(24).

The regions offering PrEP increased. Kampala has had the greatest number of PrEP initiations compared to all the other regions. This could be attributed to the fact that Kampala started implementing the PrEP program earlier than the other regions(25). This programmatic experience puts Kampala ahead of the rest. Karamoja region has not had any PrEP initiations. This is because, annual Spectrum Estimates have shown that Karamoja is a low HIV incidence region and therefore has never received PEPFAR PrEP targets.

More than half of the AGYW initiated on PrEP were aged 20-24 years. Similarly, being aged 20-24 years was associated with an increased likelihood of PrEP initiation. This could be due AGYW aged 20-24 being more independent and knowledgeable about PrEP (27). In addition, this could be attributed to the fact that those aged 15-19 years are not expected to be sexually active by society thus fear to initiate PrEP. This finding is similar to another study by Kayesu, Ivy, et al. where participants aged 15-19 years reported lack of interest in PrEP due to fearing

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being judged by people in their communities to be sexually active (15). In addition, similar findings were reported in a study conducted among PEPFAR supported countries where 64% of the AGYW who initiated PrEP were aged 20-24 years (28).

Being reached through outreaches and work places were associated with an increased likelihood of PrEP initiation. This may be attributed to the fact that taking PrEP to work places and outreaches makes access easier as one doesn't require transport money. Work places present an opportunity of safe spaces for PrEP initiation since the AGYW are not in fear of meeting with relatives and community members unlike while at health facilities. Similar finding were reported that use of safe places protect AGYW from shying away from PrEP due to fear of meeting with relatives while at the health facility(23). In addition, availing PrEP at work places may come-in handy as a solution to the inconvenient schedules in securing PrEP for those in formal employment. In Malawi, participants reported that their interest in initiating PrEP was dependent on the ease of accessing it (29). In another study conducted in Kampala, it was reported that having to travel to distant areas and living far from health facilities hindered some participants from picking up their PrEP re-fills and it can't be any different for initiation (15). Similarly, in a study done among female sex workers, 91.6% preferred having PrEP services provided through outreaches to health facilities(30).

Provision of PrEP within PMTCT was associated with a reduced likelihood of initiation. This could be attributed to fear (stigma) of being seen with the PrEP medication by relatives and friends. On the contrary, visiting PMTCT comes with continuous interaction with peers who are knowledgeable on PrEP. Some AGYW in Kenya noted that conversations held with knowledgeable and experienced peers influenced their understanding of PrEP resulting in initiation, not forgetting that peers are known for having greater influence over adolescents' decisions (13).

Of the eligible AGYW, about a tenth declined PrEP. Of these, we found out that only 14% had reasons for declining PrEP initiation documented. More than half of those with reasons documented, reported that they would not wish to take daily medication and nearly a third reported that they didn't need PrEP. Similar findings were reported in studies in Kenya where AGYW reported that the need to take a daily pill was a major inhibitor to PrEP initiation (12, 13). This finding builds a case for rolling out and scaling out newer long acting and discrete PrEP products like the PrEP Ring and long acting cabotegravir.

Study limitations

Some variables (continuity on PrEP and seroconversion) had missing data and as a result, were dropped. In turn we were unable to determine how the optimal PrEP initiation translates into continuity in the program. Given the use of secondary data, we were not able to get detailed a understanding of the reasons for declining PrEP among AGYW.

Conclusion

PrEP initiation was high among eligible AGYW. Dislike of daily medication was the main reason for declining PrEP. Kampala had the greatest number of PrEP initiations compared to all the other regions. Being aged 20-24 years, having a casual partner, being reached through outreaches, and workplaces were associated with an increased likelihood of PrEP initiation.

Recommendations

Ministry of Health should expedite the introduction and scale up of alternative PrEP regimes such as long acting cabotegravir and the dapivirine ring as these might result in greater PrEP initiation among eligible AGYW. In addition, there is need to strengthen differentiated service delivery models that are adaptive to client needs and lessen access barriers. Ministry of Health needs to support heath facilities to develop strategies to increase PrEP screening and initiation among AGYW within the departments offering PrEP to reduce on the missed opportunities since majority of the screened AGYW were from the outreaches.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' contributions

SW took the lead in conceptualizing the study idea, data analysis, writing, and editing the bulletin. IS, LB, BK, RM, EJN, HK, PM, and ARA were involved in the conceptualization of the study idea and the writing, editing, and reviewing of the bulletin. All authors read and approved the final bulletin.

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Acute Haemorrhagic Conjunctivitis Outbreak caused by Enterovirus Type C in Luzira Prisons, Kampala, Uganda, March–April 2024

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Summary

Background: On February 25, 2024, an inmate with suspected Acute Haemorrhagic Conjunctivitis (AHC) was remanded at Kampala Remand Prison (KRP) from Kansanga Police Post. A notification was subsequently sent to the Ministry of Health (MoH) on March 7, 2024, having noted a rise in the number of cases to 314 by Mar 6, 2024. We investigated to determine the cause and extent of the outbreak, identify risk factors for its spread and to recommend evidence-based interventions to control the outbreak and prevent future similar outbreaks.
Methods: We investigated the outbreak in 4 prisons of Luzira: KRP, Murchison Bay Prison (MBP), Luzira Upper Prison (LUP), and Luzira Women Prison (LWP). We defined a suspected case as onset of redness in one or both eyes with one or more of the following: tearing, discharge, grainy sensation, itching, pain, or swelling, in a resident Luzira Prison from February 1 to April 3, 2024. A confirmed case was any suspected case with a positive Polymerase Chain Reaction (PCR) result for Enterovirus type C. We found cases through medical records review and active case search among inmates. We collected 10 conjunctival swabs for PCR testing. We calculated the overall and prison-specific attack rates (AR). We assessed the prison environment, case management, and compared 200 cases to 200

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controls in a case-control study to evaluate the risk factors. We identified risk factors associated with spread logistic regression.
Results: A total of 1,935 cases were recorded with 4 confirmed to have been caused by Enterovirus Type C and no deaths recorded. The mean age was 30 years (SD=9.4) and the overall AR was 23% (1,935/8,518). The most affected prison was MBP with an AR of 41% (1,229/3,000) followed by KRP at 33% (610/1,835). Infected inmates were continuously admitted into KRP and a plea bargain meeting in KRP attended by inmates from the other prisons triggered the spread of the outbreak in MBP. Cases were being managed through application of Tetracycline Eye Ointment (TEO) and short isolation periods (3 days). Sharing of eye medication (aOR:5.3, CI=2.8-9.9) increased the risk for the spread of infection while frequent handwashing reduced odds of getting AHC (aOR:0.51, CI=0.09-2.8).
Conclusion: Enterovirus Type C was the cause of AHC in this prison setting, introduced by infected inmates. Plea-bargains, and sharing eye medications likely propagated the outbreak. We recommended immediate screening of new arrivals, reporting suspected cases to health facility staff, prompt isolation, and organizing separate plea-bargains to minimize inter-prison interactions, so as to mitigate future risks.

Introduction

Conjunctivitis is a disease characterised by inflammation of the eye mucous membranes, which can be attributed to different aetiologies. These include viral bacterial, allergic, parasitic, and non-specific causes. Despite these many causes, viruses are responsible for about 80% of acute conjunctivitis. Outbreaks of conjunctivitis are mostly attributed to two main groups of viruses (Adenoviruses and Enteroviruses), particularly enterovirus type D (EV70) and Enterovirus type C (Coxsackievirus CVA24), which causes Acute Haemorrhagic Conjunctivitis (AHC)(1) . This disease, commonly known as 'red eye' is a is particularly characterized by inflammation and reddening of the eye membranes, pain, tearing, and eye discharge, usually over a short incubation period of 12 to 48 hours.
Acute Haemorrhagic Conjunctivitis (AHC) is more common in tropical regions due to favourable climatic and environmental conditions, such as Uganda. Acute Haemorrhagic Conjunctivitis is highly contagious, spreading rapidly among persons through direct contact, or indirectly through sharing of beddings, clothes, eye glasses, and eye medications. Outbreaks are more common in congested settings such as schools, military barracks, prisons, and refugee camps (2–4).
In Uganda, the first reported outbreak of AHC was in June 2010 in 26 districts (5) followed by another outbreak that occurred in Gulu District in November 2016 among inmates in a prison. Both outbreaks were caused by Coxsackievirus CVA24.
On February 25, 2024, an inmate suspected of having AHC was remanded at Kampala Remand Prison from Kansanga police post. A notification was subsequently sent to the Ministry of Health (MoH) on March 7, 2024. We investigated to determine the cause and extent of the outbreak, identify risk factors for its spread and to recommend evidence-based interventions to control the outbreak and prevent future similar outbreaks.

Methods

Outbreak setting

The outbreak occurred in Luzira Prisons located in Nakawa division in south eastern Kampala, Uganda. It is a prison for both males and females. It is complex of 4 different prisons, namely; Kampala Remand Prison, Murchison Bay Prison, Luzira Upper Prison, and Murchison Bay Women Prison. The prison was initially designed to accommodate 1,700 inmates but currently has close to 8,000 inmates. Kampala Remand prison is a dynamic prison, meant for 600 inmates, but currently accommodating about 1,840 inmates. Daily, about 250 inmates exit the prison to attend court sessions, some inmates are released from court, and on return new crime suspects are remanded. The prisoners sleep in wards, equivalent to dormitories. The prison has 12 prison wards and one Health Centre (HC) III.
Murchison Bay Prison hosts approximately 3,000 inmates despite its intended capacity being only 600 inmates. It houses the referral hospital (Murchison Bay Hospital) for all Uganda prisons. The referral hospital has a dedicated ophthalmic clinical officer, despite the ophthalmic clinic lacking basic diagnostic tools.
Luzira Upper Prison (maximum security), is designed for inmates with sentences of 20 years or more. By the time of this investigation, the prison had 3,013 inmates. Luzira Women's Prison in Uganda's maximum-security prison for females, accommodating 670 at the time of the investigation.
Case definition and case finding
We defined a suspected case as onset of redness in one or both eyes with one or more of the following: tearing, discharge, grainy sensation, itching, pain, or swelling, in a resident Luzira Pris
on from February 1, 2024 to April 3, 2024. A con-

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firmed case was a suspected case with a positive PCR result positive for Enterovirus type C. We found cases through medical records at the health facilities located within the respective prisons in Luzira. We also actively searched for cases from among inmates with the help of health workers, and the "ward doctor", who are the equivalent of Village Health Teams (VHTs) at the community level. We then generated a line list.

Descriptive epidemiology
We computed attack rates (AR), stratified by prison based on the population at the time when Azithromycin prophylaxis was administered. We described cases by clinical manifestations, likely exposures, and also constructed an epidemic curve to show the distribution of cases over time.

Environmental assessment
We assessed for factors that could have been associated with the introduction of conjunctivitis into the prisons and its propagation among inmates. We assessed the flow of prisoners, availability, and functionality of handwashing facilities, and isolation of identified cases.

Case management
We assessed how the eye medication was administered and the duration of isolation of identified cases.

Laboratory investigations
We collected 10 samples (conjunctival swabs) from suspected cases and sent them to Uganda Virus Research Institute (UVRI) for Polymerase Chain Reactions (PCR) testing and gene sequencing.

Hypothesis generation
We generated hypotheses from the descriptive epidemiology and hypothesis generating discussions with 'doctor wards', health facility staff, and prison officers in charge of welfare and reception, about potential risk factors for transmission of conjunctivitis. The interviews included questions on the flow of prisoners, sleeping next to someone sick, movement outside current prison, isolation of infected inmates, availability of handwashing facilities, administration of eye medication, and receiving visitors.

Case control study
We compared exposures of 200 cases to those of an equal number of controls randomly selected and matched by prison. We defined a control as any resident of Luzira prison with no history of redness in one or both eyes and none of the following signs; eye itching, discharge, swelling, tearing, or discharge since February, 2024 to March 18 2024. Controls were similarly interviewed using the structured questionnaire. We identified possible risk factors associated with spread using logistic regression.

Ethical considerations
This outbreak investigation was in response to a public health emergency. Ministry of Health (MoH) gave administrative clearance to investigate this outbreak. The office of the Centre for Global Health, US Centre for Disease Control determined this investigation to be non-research since its primary intent was public health control of a disease. Additionally, we obtained administrative clearance from the Uganda Prisons Headquarters before conducting the investigation. We obtained verbal consent from all respondents with guidance of the prison administration. All cases identified during case-finding were referred to the prison health facility staff for further management.

Results

Descriptive epidemiology
A total of 1,935 cases were affected by AHC in all the 4 prisons by April 2, 2024 with no deaths. Of these, 4 were confirmed to be caused by Enterovirus type C. The mean age of case-patients was 30 years (SD=9.4)
All the case-patients reported having presented with reddening of eyes (Figure 1).

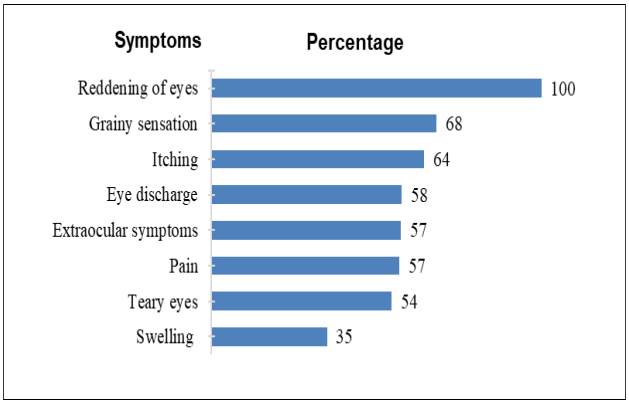

Figure 1: Distribution of symptoms among case-patients during an outbreak of acute haemorrhagic conjunctivitis, Luzira Prison, February – March 2024

The overall AR was 23% (1,935/8,518), with males being most affected (97%, n=743) compared to fe-

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males (3%, n=20). Murchison Bay Prison with 1,229 cases (AR: 41/100) was the most affected prison (Table 1).

Table 1: Attack rates by prison during an outbreak of acute haemorrhagic conjunctivitis, Luzira Prison, Kampala, Uganda, February 1- April 2, 2024

Prison Name	Cases	Total population	Attack rate (AR/100)
Murchison Bay Prison	1,229	3,000	41
Kampala Remand Prison	610	1,835	33
Murchison Bay Women's Prison	83	670	12
Luzira Upper Prison	13	3,013	0.4
Total	**1,935**	**8,518**	**23**

This outbreak started with admission of infected inmates at Kampala Remand Prison from February 28, 2024. The index case was identified by health workers on March 1, 2024. Kampala Remand Prison hosted a plea bargain meeting on March 5, 2024, attended by inmates from Murchison Bay Prison (Figure 2).

This was an event conducted within the confines of specific prisons with legal representatives present, convene inmates from various prisons. Prophylaxis with Azithromycin tablets was administered to inmates on March 8 and 9, 2024. Sharing of topical eye treatments between infected and non-infected inmates started on March 12. On March 15, there was a peak in the number of resident cases. This sharing of eye medication was discontinued on March 19 and inmates' medication was administered separately by the "doctor ward". Immediate isolation protocols for newly-admitted inmates were initiated thereafter. Infected inmates continued to be admitted into KRP beyond the time of the investigation (Figure 2), and the overall AR in Kampala Remand Prison was 33/100.

The initial case reported in Murchison Bay Prison involved a prisoner referred to the Prison Hospital on March 1 and 3, who was promptly isolated upon admission. On March 5, a plea bargain meeting convened at Kampala Remand Prison, with attendance from inmates representing Murchison Bay and Upper Prison. Subsequently, cases of conjunctivitis emerged among inmates at Murchison Bay Prison on March 6. As a preventive measure, oral Azithromycin prophylaxis was administered on March 12, followed by the distribution of tetracycline eye ointment (TEO) two days later. TEO served both as prophylaxis for those without symptoms and as a treatment for affected individuals.

Despite these interventions, the number of cases steadily increased over time, marked by multiple peaks in incidence (Figure 2).

Starting from March 26, additional public health measures were implemented. These included providing Continuous Medical Education (CME) sessions for healthcare workers and laboratory staff, conducting health talks for inmates, and promptly isolating and treating identified cases upon detection. These public health measures preceded a noticeable decline in the number of reported cases (Figure 2).

Women's Prison Luzira

The index case here was identified on March 16, 2024, as an inmate who attended court 2 days earlier (March 14, 2024), and reported to have shared a bus with an infected inmate from Murchison Bay on her way and from court (Figure 2).

Luzira Upper Prison

The data obtained from Luzira Upper Prison indicated that cases of conjunctivitis were routinely recorded in the health facility records. The first suspected case of AHC was detected on March 11 (Figure 2).

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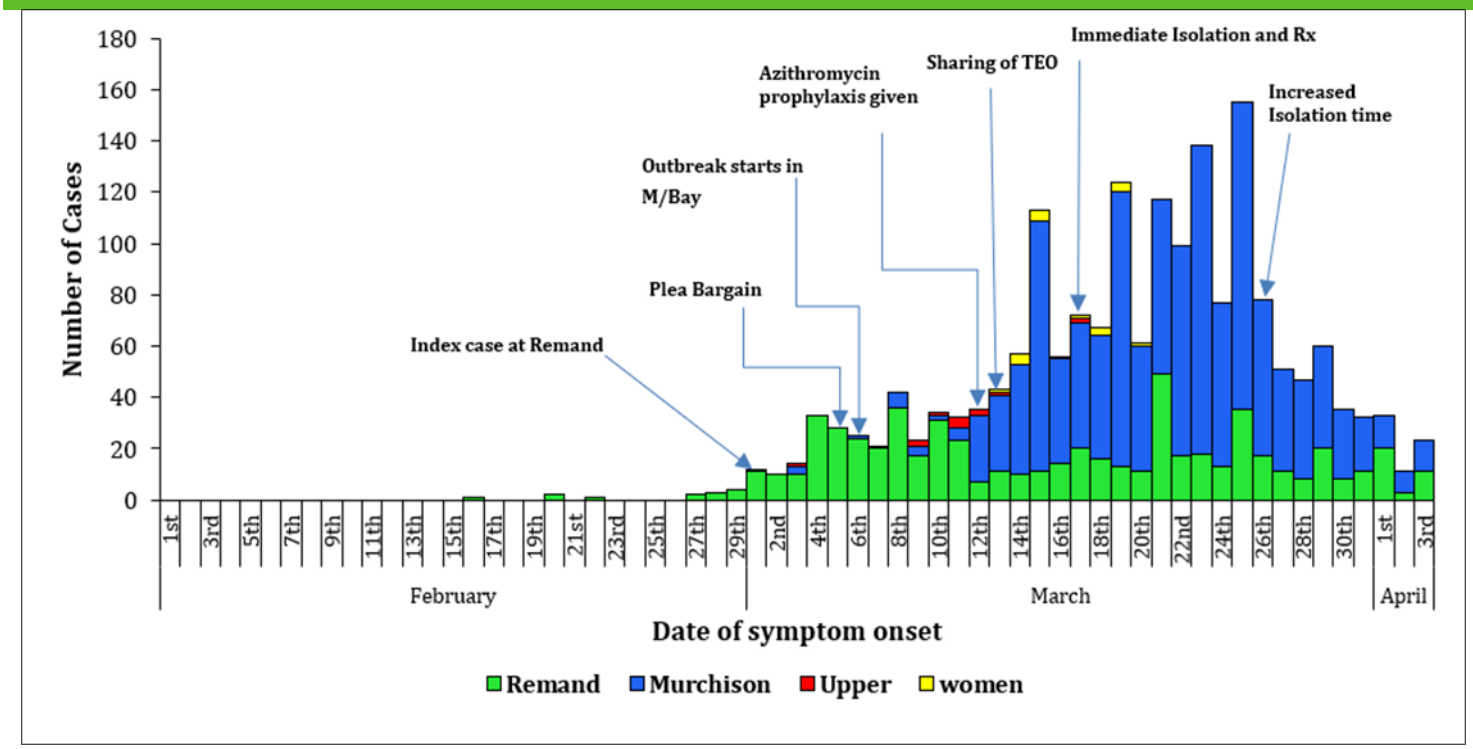

Figure 2: Distribution of AHC cases over time in Luzira Prisons, February 1 – April 3, 2024

Overall, the outbreak in Murchison Prison was preceded by that in Remand Prison, and by April 3, a total of 1,935 suspected cases had been reported to the prison health facilities (Figure 2).

Environmental and case management assessment findings

Kampala Remand Prison every day transports 150 – 200 inmates to attend different court sessions. In contrast, the maximum-security prison (Upper prison) transports an average of 80 inmates to courts daily and these are usually to different courts from those which inmates from both Kampala remand and Murchison Bay prison go to.

Some inmates are released from court, while at the same time, new inmates are remanded. Murchison Bay Prison receives prisoners referred from other prisons for medical attention at Murchison Bay Prison hospital. There was a plea bargain session at Remand prison where some inmates from Murchison Bay attended.

We observed the presence of tap and tank water at the gate and at entry points of the prison wards. Some handwashing points both soap and water while others had only water. In some prison wards, water was pre-mixed with liquid soap.

In the earlier days of the outbreak, cases were isolated and treated. Later, the number of cases were so high that isolation was no longer possible. Identified cases were treated from the prison wards where inmates resided. Treatment was being administered topically by the “doctor ward” using their hands to all inmates in spite of the disease status of the inmates. This was not observed in both the Upper prison and the women’s prison. By this time, only those that had severe eye discharges were isolated. Isolation initially lasted only up to 3 days in Murchison Bay prison. However, in upper prison, isolation was sustained until prisoners recovered fully from the infection.

Hypothesis generation findings

Based on the laboratory and the environmental assessment findings, we hypothesized that receiving Azithromycin prophylaxis helped prevent development of new cases among inmates. Sharing eye medication was associated with propagation of the outbreak among inmates. Poor hand hygiene was associated with increased transmission of AHC among inmates.

Case control investigation findings

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We noted that sharing of eye medication (aOR:8.3, CI:3.8-18) was significantly associated with acquiring the infection among inmates, while more frequent hand washing reduced the odds of getting conjunctivitis (aOR:0.11, CI:0.03-0.37). Notably, there was no difference in odds between those who received Azithromycin prophylaxis and those who did not (aOR:0.4, CI:0.34-5.8) (Table 2).

Table 2: Factors associated with acute haemorrhagic conjunctivitis among inmates during an outbreak, Luzira prisons, Uganda, March–April 3, 2024

	Cases		Controls					
Variable	**n=200**	**%**	**n=200**	**%**	**COR**	**95%CI**	**AOR**	**95% CI**
Sharing eye medication (n=242)								
No	63	55	111	87	Ref	Ref	Ref	Ref
Yes	51	45	17	13	5.3	2.8-9.9	8.3	3.8-18
Azithromycin prophylaxis (n=272)								
No	9	8	8	5	Ref	Ref	Ref	Ref
Yes	103	92	152	95	0.23-1.6	0.4	0.4	0.34-5.8
Sleeping next to someone sick								
No	23	12	47	24	Ref	Ref	Ref	Ref
Yes	175	88	150	76	2.4	1.4-4.1	2.3	1.4-4.1
Frequency of washing hands (n=400)								
Never	4	3	4	2	Ref	Ref	Ref	Ref
Occasionally	59	23	26	13	0.083	0.3-5.6	0.28	0.08-1.03
Frequently/almost half of the day	66	33	55	28	0.51	0.12-2.1	0.2	0.05-0.67
Always/More than half of the day	72	41	114	57	0.85	0.20-3.6	0.11	0.03-0.37

Discussion

This investigation confirmed an outbreak of AHC in Luzira Prison among inmates, attributed to Enterovirus Type C. The outbreak primarily affected Murchison Bay Prison, initially spreading from Remand Prison. Despite prophylactic antibiotic administration, new cases continued to arise. In the Women's Prison, the outbreak originated from an index case who shared a bus with an infected inmate from Murchison Bay on their way to court. Sharing eye medications increased the odds of conjunctivitis among Luzira Prisons inmates.

The outbreak was attributed to Enterovirus type C, and this is consistent with other findings from other outbreak findings indicating that Enteroviruses EV70 and CA24V are responsible for most AHC outbreaks (2,6–9). It was observed that cases resolved within a span of 4-5 days with no severe complications documented. Our findings do not differ from students in a resident school that suffered from AHC and averagely spent 6 days unwell (3).

The variation in attack rates among prisons can be attributed to the distinct operational and functional characteristics of each facility. Remand Prison, for instance, experiences a continuous influx of new inmates from various police cells and courts of law on a daily basis, with remanded individuals frequently leaving to attend court hearings. This dynamic environment likely contributed to the initial case and the ongoing spread of conjunctivitis within the prison.

The outbreak in Murchison Bay Prison ensued following the outbreak in Remand Prison, potentially attributed to inmates from Murchison Bay participating in a plea-bargain meeting held at Kampala Remand Prison. These gatherings, conducted within the confines of specific prisons with legal representatives present, convene inmates from various prisons. The close proximity and crowding inherent in these assemblies likely facilitated disease transmission from infected individuals in Remand Prison to those in Murchison Bay, underscoring the significant role such events play in propagating illness within carceral environments. To mitigate the risk of future outbreaks, prison authorities could consider implementing

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screening measures for Acute Hemorrhagic Conjunctivitis (AHC), thereby excluding affected individuals from participation in such assemblies including plea-bargain meetings (10).
Upon the outbreak's emergence, the prison administration swiftly implemented control measures, including the prophylactic administration of antibiotics like Azithromycin and Tetracycline Eye Ointment. However, these measures failed to curb the outbreak's spread; laboratory samples later confirmed the causative agent to be a virus. Notably, the administration of eye medication (Tetracycline Eye Ointment and Chloramphenicol) may have inadvertently facilitated the outbreak's propagation among inmates. Prison ward leaders referred to as "doctor wards," were administering eye medication to infected and non-infected inmates alike, using the same tubes and initially applying TEO directly to inmates' eyes with their hands. This direct contact likely propagated the outbreak's spread from infected to uninfected inmates. Sharing eye medications has been demonstrated to propagate outbreaks of conjunctivitis. Additional data highlight increased risk of AHC spread through sharing topical eye treatments, emphasizing the need to discourage such practices (10,
11). Given these findings, it is imperative to minimize contact between infected and non-infected inmates. Implementing screening protocols and promptly isolating and treating individual cases are pivotal steps in mitigating the rapid spread of infection within prison settings.

Initially, all identified cases were isolated. However, as the number of cases grew substantially, it became impractical to isolate every individual until recovery due to space constraints. The prison's capacity is already stretched, being approximately 300% over its initial design capacity for inmates. Consequently, isolation was restricted to individuals exhibiting symptomatic signs, with a limited duration of 3 days or less. After this period, sick inmates were returned to their respective prison wards. The remaining cases were managed within the overcrowded wards, leading to unavoidable close contact between infected and unaffected inmates. Sleeping close to infected inmates and subsequent sharing blankets among inmates was associated with increased odds of developing AHC. This concurs with other studies in Brazil, USA and China, where AHC spreads through sharing fomites with infected persons (10–13). Particularly in Kampala Remand Prison, it was commonplace for inmates to be released even after less than a week of incarceration, and “doctor wards” are not exempt. This rapid turnover posed challenges for trained personnel in identifying cases, reporting them, and administering eye medication effectively. Many trained individuals were released shortly after their training, leaving insufficient time to adequately train and orient new staff. Consequently, there was significant variability in the application of eye medication by different personnel within the prison.
Despite this issue, we observed that there was sufficient provision of handwashing stations throughout the prisons. Our findings indicated that frequent handwashing was beneficial in mitigating the spread of infection. Frequent hand washing with soap and water prevented infection spread, consistent with findings from previous studies conducted in the USA and India (6,11–13).

Study limitations

The main limitation of this investigation pertains to the scope of our study, as we were unable to provide a comprehensive depiction of the outbreak's evolution and scope across various prisons. Our focus was primarily on the outbreak within the Luzira prisons, and thus, we did not explore potential clusters in other prison facilities or communities (e.g., schools). Consequently, we cannot definitively determine whether these clusters were epidemiologically linked to the outbreak in Luzira prisons. The absence of such epidemiological insights limits our ability to develop evidence-based control measures more effectively.

Conclusion

In conclusion, our investigation confirmed Enterovirus type C as the causative agent of the conjunctivitis outbreak in Luzira Prison. The outbreak exhibited varying impacts across the different prisons, with Kampala Remand Prison being the most affected. This can be attributed to its dynamic nature, where inmates are regularly discharged and new ones are detained from various police cells and courts on a daily basis. The outbreak in Murchison Bay was a spill-over from Remand Prison owing to prisoner mixing during a plea-bargain mass meeting. Despite the prophylactic administration of antibiotics during the outbreak, the viral nature of the infection hindered the desired effect of preventing further transmission among inmates. Sharing of topical eye medication contributed to the rapid propagation of conjunctivitis among inmates. While frequent hand washing reduced risk of getting the infection.

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Public health actions

During our investigation, we conducted sensitization sessions for inmates on the importance of proper hand hygiene. We also provided training for "doctor ward" on the correct administration of eye ointments and drops, emphasizing the need to promptly report and refer suspected cases to health facilities. We discussed and worked closely with prison administration and health facility staff to implement immediate measures. All cases identified during case-finding were referred to prison health facility staff for further management. Following the dissemination of our findings, the isolation time was increased from 3 days to 5-7 days. Continuing medical education (CME) sessions were conducted for healthcare workers, and clinical and laboratory staff were trained on sample collection, storage, and referral procedures. An assessment of prison laboratory capacity for outbreak readiness was conducted by the LLP team, and recommendations for improvement were provided to prison authorities and partners.

To disseminate our findings, a preliminary report of the findings was presented to the Uganda Prison Services Headquarters and the Public Health Commission.

Recommendations

We recommend that communal events such as plea bargain could in future be held for each individual prison to prevent transmission of disease from one prison to another.

We also recommend a strong emphasis on personal hand hygiene; water and soap, preferably pre-mixed, should be made readily available at all possible hand washing points throughout the prisons.

Mass prophylactic administration of antibiotics may be considered only when a bacterial cause has been confirmed.

On entry, all inmates would better be screened for signs conjunctivitis, and the identified cases promptly reported to the health facility and isolated, for at least 5 days. In Murchison Bay and Women's prison, new inmates could be quarantined for 5 days before they are made to mix with other inmates.

We further recommend separation of topical eye medication between infected and non-infected inmates, coupled with continuous surveillance and reporting suspected cases to health facility staff.

Finally, the prison authorities could consider appointing "Dr Wards" who are convicts, especially in Kampala Remand Prison. This is because of the high turnover of inmates, where by a "doctor ward" is likely to be released after a short duration of incarceration, meaning a new "doctor ward" has to be trained in surveillance and reporting of cases on his ward.

Conflict of Interest

The authors declared no conflict of Interest

Author Contribution

All authors participated in investigation, design of data collection and entry tools and cleaning and review of the bulletin draft. HK led the investigation team and took the lead in drafting the bulletin. CM, EM, LON, and BA participated in data analysis. RM, BK, DG and SG supervised the outbreak investigation and reviewed the bulletin draft to ensure intellectual content and scientific integrity. RM, BK, and ARA reviewed the final bulletin for intellectual content and scientific integrity.

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Investigation of an Outbreak of Acute Haemorrhagic Conjunctivitis at School X in Kampala City, March 2024

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Summary

Background: On March 11, 2024, Kampala Capital City Authority received an alert of increase in the number acute haemorrhagic conjunctivitis (AHC) cases at an infant School X in Kampala City. We investigated the outbreak to determine the scope, identify factors associated with its spread, and recommend control and prevention measures.
Methods: We defined a case as redness of one or both eyes and any of the following: tearing, swelling, itching, discharge in a pupil or staff of school X from March 5-31, 2024. We identified cases by reviewing health records at the school. We calculated attack rates (AR) by ages, sex, class, and dormitory using staff and pupils of the infant school as source population. We also conducted staff interviews and an environmental assessment. We conducted an unmatched case-control study. We defined a control as a pupil or staff of school X who had not had AHC from March 05 to March 31, 2024. We identified factors associated with the spread of AHC in the school using logistic regression.
Results: We found 175 cases, 167 of whom were pupils and 8 were staff. The mean age for

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case-patients was 11.4 years (range 5–45 years). Attack rates (%) were similar in females and males (10 vs 8.4). Pupils in the boarding section were more affected than day scholars (AR:23) with residents of Alpha dormitory more affected than other dormitories (AR:50). Pupils in P4-P7 were the most affected compared to lower class groups (AR:17). We found that being a boarding scholar (aOR=10, 95%CI: 2.1-51) increased the odds of AHC. Persons who washed their hands at arrival back at the dormitory/home (aOR= 0.38, 95%CI: 0.16-0.91) and pupils in classes P4-P7 (aOR= 0.34 95%CI: 0.14-0.77) were protected against AHC. We observed that most dormitories were congested with pupils sleeping in triple decker beds, some adjacent beds had no space separating them. Hand washing facilities were also not well distributed.
Conclusion: The outbreak was likely facilitated by dormitory congestion and poor hand hygiene practices. Boarding scholars were most affected; regular hand washing and attending upper classes were protective. Education and awareness of good hand hygiene measures could mitigate the risk of similar outbreaks in the future.

Background

Conjunctivitis, commonly known as “AHC” or “pink eye", is an inflammation of the conjunctiva, the transparent membrane that lines the eyelid and eyeball. It can be caused by a bacterial or viral infection, allergies or can be toxin- induced. Viral conjunctivitis followed by bacterial conjunctivitis is the most common cause of contagious conjunctivitis, while allergic and toxin-induced conjunctivitis are non-contagious (1).
Diagnosis of AHC is usually made on the basis of clinical presentation and patient history. A mucopurulent discharge is often associated with bacterial AHC while watery discharge has been more consistent with viral conjunctivitis (4). The common pathogens for bacterial conjunctivitis are *Staphylococcus* species followed by *Streptococcus pneumoniae* and *Haemophilus influenzae*. Bacterial conjunctivitis is more common in children than in adults (3).
Viral conjunctivitis accounts for up to 75% of acute conjunctivitis cases. Adenoviruses followed by Enteroviruses and Coxsackieviruses are the most commonly isolated causative agent of acute haemorrhagic conjunctivitis (AHC). AHC is characterized by inflammation, reddening and swelling of the conjunctiva, itching, increased tear production, feeling like a foreign body is in the eye, crusting of eyelids or lashes, and discharge (5). The incubation time is 1-3 days from the exposure to the infection. Common complications include photophobia, blurred vision, and severe headaches. It spreads from person to person through contaminated hands and through sharing contaminated personal items such as clothing, towels, and accessories like sunglasses and eye makeup (4,6).
On March 11, 2024 Kampala Capital City Emergency Operations Centre received an alert from school X in Kampala City. It stated that several learners were ill with AHC and requested for help in managing the outbreak. We investigated to determine the scope of the outbreak, identify factors associated with its spread, and to recommend control and prevention measures.

Methods

Outbreak area
This outbreak occurred at school X in Kampala City. School X is a mixed day and boarding nursery and primary school with approximately 1,800 learners, 700 of whom were in the boarding section. The school also had 148 staff consisting of teachers, matrons, medical, and security personnel.
At the time of the outbreak notification, Kampala City was experiencing an outbreak of AHC, and more than 1,000 cases had been reported in prisons and communities all over the city. No school had reported any cases to local authorities at the time.
Case definition and finding

We defined a suspected case as redness of one or both eyes and any of the following: tearing, swelling, itching, discharge in a pupil or staff of school X from March 5-31, 2024. A confirmed case was suspected case with a positive result on bacterial culture in ocular swab specimens from a pupil or staff of school X from March 05- 31, 2024. To find cases, we reviewed records from the school sick bay. For each case-patient line listed, we conducted follow-up interviews with the school nurse and child on presentation of symptoms, treatment, and possible linkage. We then created a line list of all cases meeting the case definition capturing variables such as dates of symptom onset, demographic characteristics, and symptoms.

Descriptive epidemiology
We described the cases by age, class group, dormitory of residence and section of study (day or boarding) and calculated attack rates for each to determine the scope of the outbreak. To describe the outbreak in terms of time, we constructed an epi-curve.

Laboratory investigations
To identify the causative pathogen, we collected ocular swabs for microbiological evaluation from six

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AHC case-patients that had not initiated antimicrobial therapy. Laboratory testing was carried out at Central Public Health Laboratories (CPHL).

Environmental assessment
To identify factors that could have been be associated with the introduction and spread AHC into School X we assessed the set-up of the dormitory facilities, play area, classrooms and handwashing facilities in School X

Hypothesis generation interviews
In order to identify risk factors for AHC, we conducted 50 hypothesis generating interviews. We interviewed case-patients about potential risk factors for AHC transmission occurring three days before onset of symptoms. These included history and nature of contact with a symptomatic case, handwashing measure, and contact with a person from outside the school.

Case-control study
To evaluate the exposures that emerged during hypothesis generation, we conducted an unmatched case-control study comparing exposures of 175 cases to an equal number of randomly selected controls. We defined a control as a pupil or staff of School X with no history of AHC from March 05 to March 31, 2024. We administered an electronic questionnaire to both cases and controls to assess exposure and outcomes of interest. For the reported hand hygiene practices, all responses falling at “sometimes” or “never” were considered non-performers of the practice and were assigned a “no” response, while those responses at “always” or “most of the time” were performers of the practices and were assigned “yes” response. We identified risk factors for transmission using logistic regression.

Ethical considerations
This investigation was in response to a public health emergency and was therefore determined to be non-research by the office of the Center for Global Health, US Center for Disease Control and Prevention. Kampala Capital City Authority (KCCA) gave permission to investigate this outbreak. Permission to conduct the investigation was obtained from the school X administration and assent was also obtained from the underage respondents. All child case-patient interviews were conducted with a staff member present. In collaboration with KCCA, we linked school X medical team to a consultant ophthalmologist to guide them on appropriate case management for the affected case-patients.

Results

Descriptive epidemiology

We identified 175 suspected cases in this outbreak, 167 of whom were pupils and 8 were staff. There were no confirmed cases nor fatalities. The average age of case-patients was 11.4 years (SD=5.1, range, 5–45 years). Both sexes were similarly affected, attack rate (AR) of 10% in females vs 8.4% in males (Table 1). By class group, pupils in P4-P7 were the most affected with AR of 17%. Pupils in the boarding section were more affected than day scholars (AR 23% vs 0.37%). All five dormitories registered cases but pupils residing in boys dormitory Alpha were most affected (AR: 50%) followed by pupils in girl’s dormitory Omega (AR:33%).

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Table 1: Attack rates by pupil characteristics at school X, during an outbreak of acute haemorrhagic conjunctivitis, Kampala City, March 2024 (n=175)

Variable	Category	Cases	Population	Attack rate (%)
Sex	Female	99	975	10
	Male	76	909	8.4
Level	Pre-primary	2	438	0.5
	P1-P3	23	622	3.7
	P4-P7	142	824	17
	Staff	8	148	5.4
Section	Boarding	165	708	23
	Day	2	1176	0.34
Dormitories	Alpha	33	66	50
	Omega	65	193	34
	Delta	29	134	22
	Beta	33	231	14
	Gamma	5	84	6.0
	Teachers quarters	8	148	5.4

All case-patients had red eyes (100%) and a watery eye discharge (Figure 1). Other common eye symptoms were grainy sensation (97%), itching (92%) photophobia (84%), swelling (83%), and pain (74%). Some case-patients also experienced non eye symptoms like flu (9%), headache (8%), and cough (5%).

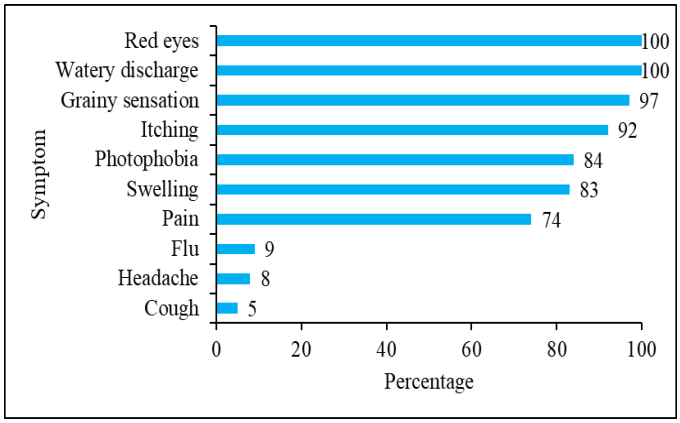

Figure 1: Distribution of case-patients by symptoms during an outbreak of acute haemorrhagic conjunctivitis at School X, Kampala City, March 2024 (n=175)

The epidemic curve suggested a propagated outbreak (Figure 2). Eight pupils at the school X. developed irritating eye symptoms on March 08, 2024. They were all male and all resided from the same dormitory. Two days later on March 10, more than 70 new cases were registered forming the first generation of cases. On March 11, 2024 KCCA Emergency Operations Centre was notified of the outbreak at the school. A second generation of cases started on March 15, rising to a small peak on March 17 and thereafter no new cases were recorded at school X.

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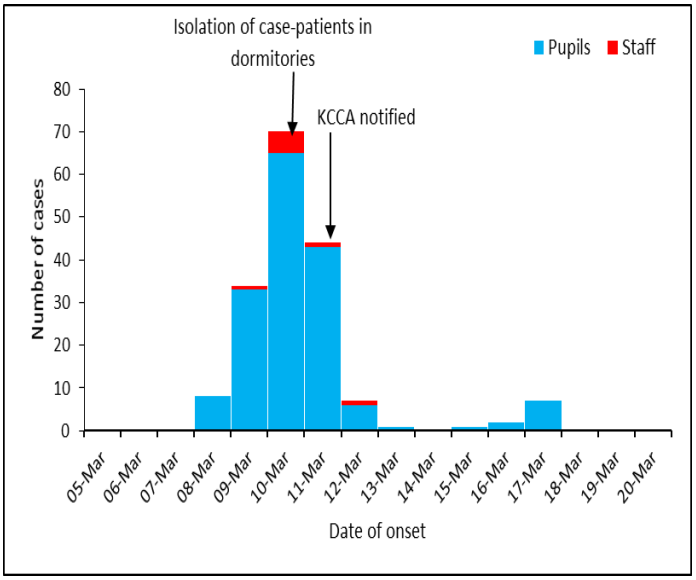

Figure 2: Distribution of cases-patients by date of eye symptom onset during an outbreak of acute haemorrhagic conjunctivitis at School X, Kampala City, March 2024 (n=175)

Laboratory investigation

No organisms were observed after gram staining. No bacterial growth was observed when the swabs were subjected to culture and sensitivity testing.

Environmental assessment

Screening: At the time of the investigation, all visitors were screened at the main school entrance and one with symptoms of AHC was not allowed to access the school. We found that there was generally regulated movement of persons to and from either the classes or dormitories.

Classrooms: The school had four classrooms for each class/level and there were 50 pupils in each stream. In the classrooms, pupils sat in pairs assigned by the class teacher. The school had an open area where the children would play from during the breaktime. There were no toys or playground equipment.

Dormitories: All the dormitories were within the school perimeter except boys dormitory Alpha. Alpha was outside the school wall, about 100 meters away. The school thus employed a private security firm to guard the dormitory in the evenings and weekends. All the other dormitories did not have guards assigned.

We observed that most of the dormitories were congested. Pupils slept in triple bunk beds with half a meter separation in between. Beds were lined up to the wall and some adjacent beds had no space separating them. The pupils used their own towels and toiletries, but sometimes shared soap with others. Personal hygiene practices like bathing and brushing happened in a public bathing area. The matrons personally took more care of the younger children, ensuring they had bathed and brushed their teeth well enough and older children were randomly inspected as they exited the dormitories to go to class for the day. We found out that in the early days of the outbreak, there was mixing of AHC case-patients and other non-ill pupils in the dormitories. The matrons reported that due to congested settings, it was hard to enforce isolation in the dormitories. But from March 10, 2024 they had come up with a strategy to reduce interaction between case-patients and their non-ill counterparts by enforcing an earlier bedtime for the case-patients.

Handwashing: Handwashing stations were placed at major school entrances and at class room blocks. The stations were pedal step activated and the contained a mild soap mixture. Dormitories did not have handwashing stations at the entrance.

We interviewed cases and controls on their hygiene practices. All reported washing their faces every morning. All practiced handwashing with soap and water before and after meals and after using the toilet.

Hypothesis generation findings

Our hypothesis generation interviews revealed that 92% had contact with a symptomatic case-patient, 63% washed their hands regularly, 2% shared personal items such as towels and handkerchiefs with a

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case-patient. Based on the descriptive epidemiology and hypothesis generation findings, we thus hypothesized that close contact with a case and poor hand hygiene practices were the potential exposures for this outbreak.

Case-control study

We enrolled 175 controls for the case-control study. In our bivariate analysis, contact will an ill person, being a boarding scholar, class group and handwashing were associated with AHC. We did not find statistically significant association between sex and age with AHC (Table 2). At the multivariate analysis stage, being a boarding scholar (aOR=10, 95%CI:2.1-51) increased the odds of AHC. Persons who washed their hands at arrival back at the dormitory/home (aOR=0.38, 95%CI:0.16-0.91) and pupils in classes P4-P7 (aOR=0.34 95%CI:0.14-0.77) were protected against AHC.

Table 2: Factors associated with acute haemorrhagic conjunctivitis at School X, Kampala City, March 2024

Category	Cases n (%)	Controls n (%)	COR (95%CI)	aOR (95%CI)
Contact with ill person				
No	9 (5)	22 (13)	Ref	
Yes	166 (95)	153 (87)	2.7 (1.2-5.9)	1.7 (0.7-4.5)
How they interact				
Share a decker	12 (7.2)	3 (2)	Ref	
Play together	120 (72)	143 (93)	4.7 (1.31-17)	
Share personal items	4 (2.4)	0 (0)	0.4 (0.017-9.3)	
Share stationary	14 (8.4)	0 (0)	0.12 (0.006-2.6)	
Others	16 (10)	7 (5)	1.8 (0.37-8.2)	
Sex				
Female	99 (57)	106 (60)	Ref	
Male	76 (43)	69 (40)	1.18 (0.77-1.8)	
Section				
Day	2 (1)	17 (10)	ref	
Boarding	165 (99)	151 (90)	9.3 (2.12-41)	10 (2.1-51)
Class group				
Pre-P3	25 (15)	13 (8)	ref	
P4-P7	142 (85)	155 (92)	0.48 (0.24-0.97)	0.34 (0.14-0.77)
Age group				
0-10	70 (40)	70 (40)	Ref	
11-15	97 (55)	102 (58)	0.95 (0.62-1.5)	
>15	8 (5)	3 (2)	2.7 (0.68-10)	
Handwashing after school				
No	22 (13)	10 (6)	Ref	
Yes	153 (87)	165 (94)	0.42 (0.19-0.92)	0.38 (0.16-0.91)

Discussion

We investigated an outbreak of AHC at School X in Kampala City. We identified 175 suspected cases of AHC, there were no confirmed cases and no fatalities. Pupils in boarding section and residents of boys dormitory Alpha were most affected. We found that being a boarding scholar was significantly associated with AHC. We also found that pupils in classes P4-P7 and those who reportedly washed their hands at arrival back at the dormitory/ home were protected against AHC.

Our study findings showed that pupils in boarding section were most affected than day scholars and we found that being a boarding scholar was significantly associated with AHC infection. This could be because the first case-patients fell ill on March 08, 2024 which was the first day of a long weekend

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(International women's day weekend). The day scholars were thus not at the school during the start of the outbreak. By the end of the weekend the school had implemented initial control measures including exempting symptomatic pupils from attending class and thus reducing the possible interaction and infection of the day scholars. Furthermore, the dormitories were congested with learners sleeping on triple decker beds lined up to the wall and some adjacent beds had no space separating them, contrary to the public health school building recommendations set out by KCCA (7).

Being in classes P4-P7 and hand washing at arrival back at the dormitory/ home were protective against AHC. A study on the protective effect of hand hygiene found that children in higher age groups such as those in P4-P7 were protected against infections (8). Hand washing is one of the recommended ways by several health protection and promotion agencies so as to limit the risk of infection with AHC (5,9,10). In this case, handwashing at arrival back to the dormitory or home for day scholars broke the person to person transmission of AHC.

Study limitations

Due to logistical limitations, i.e., absence of molecular testing capacity, we failed to identify the causative pathogen in this outbreak. However, the case symptom presentation was consistent with AHC. The commonest eye symptoms in this outbreak were red eyes, watery discharge, grainy sensation, itching, photophobia, swelling, and pain which are typical symptoms used for the clinical diagnosis of AHC (11).

Conclusion

The outbreak at School X affected both pupils and staff members. Its spread was likely facilitated by dormitory congestion and poor hand hygiene practices. Education and awareness of good hand hygiene measures would prevent such outbreaks in future in the similar settings. We also recommended routine surveillance for AHC to help identify patterns and detect outbreaks earlier, which may help curb transmission in congregate settings such as schools.

Given that AHC can be spread by contact with fomites contaminated with the virus, we recommended disinfection of dormitories and classes and regular washing of personal items used by the case-patients.

Public health actions

We intensified early case finding by the matrons by teaching them the common symptoms to look out for and emphasized the temporary isolation for all case-patients at all dormitories. We held health education sessions educating learners on the signs and symptoms, transmission, and preventive measures for AHC. We also encouraged learners to practice good personal hygiene. We consulted with a senior ophthalmologist in Kampala City to guide on the management of the case-patients.

Conflict of interest

The authors declare that they have no conflict of interest.

Author contribution

All authors contributed to the write-up and review of the bulletin. DA wrote the drafts of the manuscript and revised the paper for substantial intellectual content. TR and AN participated in the investigation of AHC at the School X. BK and RM supervised the investigation and reviewed the bulletin for substantial intellectual content. SKZ and DAO were involved in the review of the paper for substantial intellectual content. LB, and ARA reviewed the draft bulletin for substantial intellectual content.

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How prepared are we for cross-border outbreaks: Lessons Learned from an imported Cholera Outbreak using 7-1-7 approach, Elegu border point, Uganda, January 2024

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Summary

Background: Cholera remains a major public health threat in Uganda, particularly in border districts that face recurrent outbreaks due to cross-border population movement. A 7-1-7 is a timeliness metric for outbreak detection, notification, and response which can be used to assess system performance. We investigated an imported cholera outbreak in Elegu Town, a border point between Uganda and South Sudan, in January 2024, highlighting the country's preparedness and challenges in managing cross-border disease outbreaks using the 7-1-7 metric.
Methods: We defined a suspected case as the onset of acute watery diarrhea in an asylum seeker at the Elegu border point from January to February 2024. A confirmed case was a suspected case in which *Vibrio cholerae* was isolated in the stool by culture or PCR. We actively searched for cases and collected data on person characteristics, symptoms, and outbreak timeliness. We used semi-structured interviews to elicit insights from district health officials on the enabling factors and bottlenecks during the response. We used the 7-1-7 metric was used to assess detection, notification, and response timeliness.
Results: Thirteen members of the same refugee family from South Sudan were diagnosed with cholera within 6 hours of arrival at the Elegu border, with 4 (31%) confirmed cases. Of the cases, 9 (69%) were female, and 7 (54%) were below eighteen years. The authorities detected, notified, and responded to the outbreak within the 7-1-7 timelines, with no significant bottlenecks identified. The outbreak was detected and notified within one day and by the fifth day, a full response was mounted. The prompt response was attributed to the recent experience with Ebola and COVID-19, the availability of a functional emergency operations center, and the presence of trained surveillance frontline health workers.

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Conclusion: The imported cholera outbreak at Elegu demonstrates Uganda's preparedness in managing cross-border disease outbreaks. Achieving the 7-1-7 targets highlights the country's capacity to detect, notify, and respond to such events. Continued investment in local-level disease detection, communication, and national-level resource mobilization will be crucial to sustaining an effective outbreak management strategy.

Introduction

Cholera remains a global public health threat, causing between 1.3 million to 4.0 million cases, and 21,000 and 143,000 deaths worldwide every year [1, 2]. For More than 50 years after its resurgence in Africa, cholera is still a major public health problem, characterized by a large disease burden, frequent outbreaks, and high case fatalities [3]. Between 2010 and 2020, 25 African countries reported 484,450 suspected cholera cases and 999 cholera outbreaks to the World Health Organization (WHO)[4]. From the late 1990s through the first decade of the twenty-first century, sub-Saharan Africa has reported more cholera deaths than any other region. Between 2007 and 2011, the annual Case-Fatality Ratios (CFRs) for cholera in sub-Saharan Africa ranged from2.22% to 2.95% [5-7]. This highlights the continued public health burden posed by cholera across sub-Saharan Africa, even in the face of advancements in scientific understanding and treatment of the disease.

In Uganda, epidemics of cholera have occurred regularly since the disease first appeared in 1971 and the disease has nearly become endemic, with cases reported every year since 2000 [8]. While many parts of the country have not experienced any outbreak of the disease, the border districts have had recurrent outbreaks in the last two decades [8, 9]. The Ministry of Health has instituted preventive and control measures that include the promotion of access to safe water, sanitation, and hygiene; health education and community mobilization; disease surveillance; and case management. However, cholera cases continue to be reported annually. Between 2011 and 2015, Uganda reported over 9,000 cases of cholera in 18 border districts, with an annual average of 60-182 deaths [9, 10]. In border districts, there is a greater chance of importation of cholera due to frequent travel by the community across borders and also the influx of asylum seekers during conflicts in the neighboring countries [11]. Cholera poses a significant threat to regions with vulnerable populations, such as refugees, fishing communities, and large urban slum settlements [9, 11].

Rapid detection, reporting, and response to an infectious disease outbreak are critical to prevent localized health events from emerging as pandemic threats. Rapid detection depends on effective disease surveillance systems leveraging data from multiple sources [12-14]. Timeliness is a key criterion for evaluating any disease surveillance system. How fast a system can detect a threat is critical for ensuring optimal performance [12, 13]. Since the West Africa Ebola epidemic of 2014–16, several frameworks have been developed to measure readiness capacity. Uganda has adopted a new global target of 7-1-7 whereby every suspected outbreak is identified within 7 days of emergence, reported to public health authorities with the initiation of investigation and response efforts within 1 day, and effectively responded to within 7 days [13, 15, 16]. With clear targets for each milestone, these metrics can inform real-time performance gaps by surfacing bottlenecks where targets are not being met. Building on the International Health Regulations (2005) and WHO's "triple billion targets" methodology, 7-1-7 metrics simplify performance evaluation, provide a blueprint for outbreak communication, and drive performance improvement [17].

On January 21, 2024, the Ugandan Ministry of Health was alerted of 13 suspected cholera case-patients at the refugee reception center at the Elegu border town, in Amuru District, bordering Adjumani District. The patients presented with profuse vomiting and acute watery diarrhea. Eighty percent (4/5) of the stool samples from the patients tested positive for *Vibrio cholerae* by both rapid diagnostic test (RDT) and polymerase chain reaction (PCR). We investigated an imported cholera outbreak in Elegu Town, a border point between Uganda and South Sudan, in January 2024, highlighting the country's preparedness and challenges while exploring enabling factors and bottlenecks in managing cross-border disease outbreaks using the 7-1-7 metric.

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Methods

Study setting

The outbreak was reported at Elegu border Town which is located in Amuru District, Acholi Sub-region at the international border with Nimule Town, South Sudan approximately 105 north of Gulu City by road. Elegu Town has a population of 17,000 people. In 2016, this same area was affected by a cholera outbreak, with 44 (99%) of the cases being refugees from South Sudan [18]. In 2021, the Ministry of Health launched an emergency operations center in Arua to combat public health emergencies including outbreaks in the West Nile region.

Field investigation

We defined suspected case as the onset of acute watery diarrhea in an asylum seeker at Elegu Town from January 16, 2024, to February 5, 2024. A confirmed case was a suspected case in which *Vibrio cholerae* has been isolated in the stool by culture or PCR.

Using the case definition, we actively searched for cases in three of the biggest health facilities and reception center communities at the border town. In the health facilities, we reviewed records and interviewed health workers, patients, and caretakers to obtain any information relating to potential cases of cholera. At the refugee reception and collection center, we interviewed new asylum seekers and refugee community leaders regarding the possibility of them having signs and symptoms of cholera.

7-1-7 assessment

The cholera outbreak was managed by a combined team of members from the Adjumani District, Arua emergency operations center, and Elegu port health authorities. 7-1-7 has been proposed as a target for outbreak detection, notification, and early response, whereby every suspected outbreak is detected within 7 days of emergence and reported to public health authorities within 1 day of detection, and seven early response actions are completed within 7 days from reporting to public health authorities, indicating timely initiation of response [13]. We evaluated the team's readiness to respond to public health emergencies using the 7-1-7 metric and assessment tool. We assessed the response timeliness, from the initial detection to the completion of the outbreak response activities. This start-to-end evaluation gauged the speed with which the district detected the outbreak, notified the Ministry of Health, and implemented the response measures. To gain insights into the response process, we interviewed the district officials who led the outbreak response efforts to understand the enabling factors and bottlenecks in the response.

Data analysis

We performed a descriptive analysis of the person characteristics of the cases, presenting numerical findings as frequencies and percentages. For the qualitative data from the interviews conducted, we employed content analysis, which enabled a systematic exploration of the participants' perspectives and experiences. Two independent coders conducted a meticulous initial coding process, analyzing the text line by line and prioritizing inter-coder reliability. Any discrepancies were resolved through discussion and consensus. Following this, the codes were systematically organized into overarching categories, and the iterative process led to the emergence of the main themes. These themes were then reviewed, refined, and validated by revisiting the raw data to ensure accuracy.

Ethical considerations

We conducted this study in response to a public health emergency and as such it was determined to be non-research. The MoH authorized this study and the office of the Center for Global Health, US Center for Disease Control and Prevention determined that this activity was not human subject research and with its primary intent being for public health practice or disease control. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. §§See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.

We obtained permission to investigate from the Adjumani District health authorities and the Nyumanzi refugee settlement authorities. We obtained verbal consent from all the respondents aged ≥18 years since were under isolation. For those aged <18 years, we obtained consent from the parents and assent from the respondents. Participants were assured that their participation was voluntary and that there would be no negative consequences for declining participation in the investigation. Data collected did not contain any individual personal identifiers and information was stored in password-protected computers, which were inaccessible to anyone outside the investigation team

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Results

Person characteristics of case-patients: Imported cholera outbreak at Elegu, Uganda-South Sudan Border, January 2024

We investigated a case of a cholera outbreak among 13 asylum seekers who belonged to the same family of 14. Originally from Khartoum, Sudan, they sought refuge in the town of Ruweng at the border between Sudan and South Sudan. Stool samples from five of the 13 suspects were sent to CPHL, Kampala, and four out of the five (80%) samples tested positive for cholera on both RDT and PCR. Of the 13 individuals, seven (54%) were children, and nine (69%) were female.

Symptoms and presentation of case-patients: Imported cholera outbreak at Elegu, Uganda-South Sudan Border, January 2024

On January 21, 2024, three hours after their arrival, 13 of the 14 family members developed acute watery diarrhea and vomiting, which are symptoms of cholera. They sought care at a nearby private facility within two hours of symptom onset. All thirteen (100%) case-patients had both diarrhea and vomiting. Eleven (85%) had general body weakness and 6(46%) had abdominal pain.

Timeline of the imported cholera outbreak at Elegu, Uganda-South Sudan Border, January 2024

The family had been staying in the Ruweng Town refugee settlement in South Sudan for a month, planning to travel to Uganda. On January 17, 2024, they left the settlement and headed south, reaching the city of Paloich on the night of January 18. There, they booked a flight to Juba for two days later, on January 20.

While in Ruweng, the family bought food and other groceries from street vendors within the refugee settlement and used water from the settlement reservoir, which was treated with chlorine. The settlement had a high influx of refugees from Sudan and an ongoing cholera outbreak at the time. The family reported receiving cholera vaccines in Sudan three months prior, but there was no evidence to corroborate this.

On their journey to Paloich, the family ate bread and a local bread called Tamia, along with water they had packed. In Paloich, they bought rice and fish from the local market and used water from the reservoir, which was provided by an NGO and treated.

Once in Juba, the family bought eggs, meat, water, and powdered juice from a supermarket, which they cooked and consumed. The next morning, they packed some eggs and bread but did not eat anything until they crossed the border into Uganda at Nimule-Elegu border point. Three hours after the last meal, 13 of the 14 members fell ill (Figure 1).

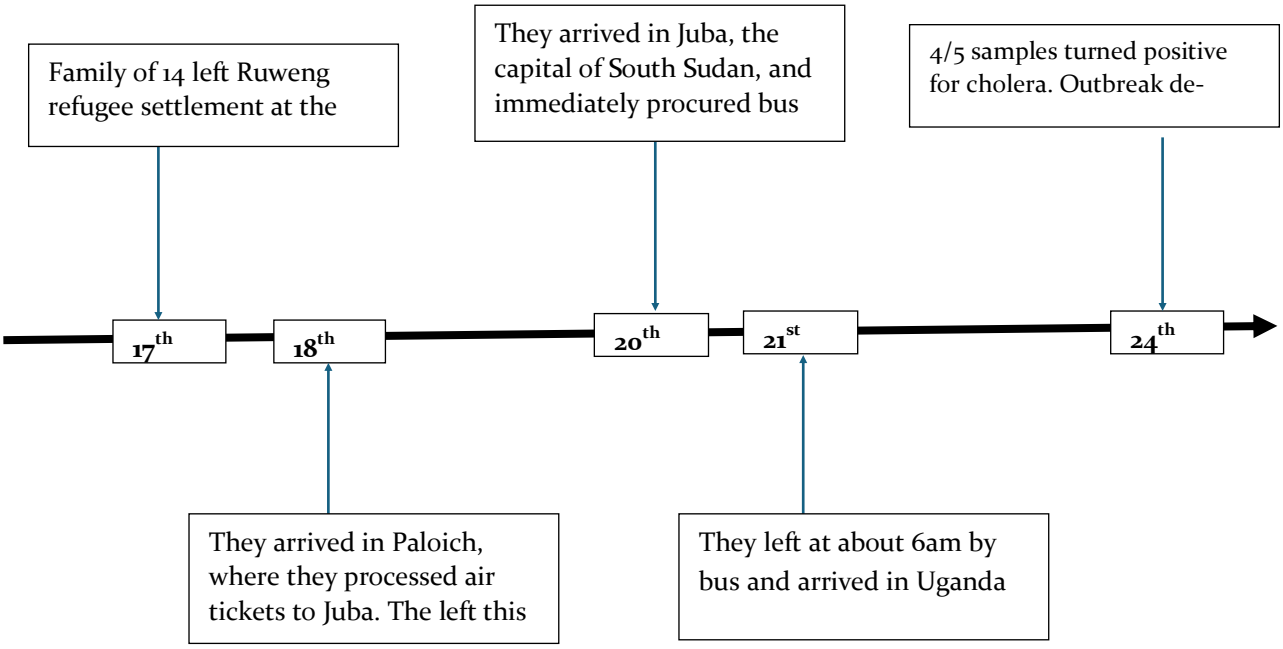

Figure 1: A Timeline of the Family: From Travel History to Outbreak Declaration, Imported Cholera Outbreak at Elegu, Uganda-South Sudan Border, January 2024

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7-1-7 Assessment findings: Imported Cholera Outbreak at Elegu, Uganda-South Sudan Border, January 2024

Detection: The initial cholera outbreak was detected on 21/01/2024 at the Elegu Point of Entry (PoE). A cluster of 14 asylum seekers sought clearance at the PoE health desk, and the index case, a 15-month-old male, exhibited initial cholera-like symptoms. The refugee reception center authorities suspected cholera and promptly completed a Case Investigation Form (CIF) on the same day. According to interviews with district officials who led the response and the frontline health workers, several key factors enabled this timely detection:

"The availability of appropriate case definitions and guidelines allowed us to quickly recognize the symptoms and suspect cholera," noted the District Surveillance Focal Person (DSFP).
"The presence of a screening facility at the Elegu refugee collection and reception center was crucial for identifying these cases early on," commented a Nyumanzi refugee settlement official.

“The swift detection of the outbreak was facilitated by the good attitude and ethics of the health workers. Our prior experience in dealing with cross-border issues during the COVID-19 pandemic also played a role in the timely response," added Assistant District Health Officer (ADHO).
Notification: Immediately following the detection, the Surveillance team from Adjumani district took swift action. An alert was sent using the 6767 system to the electronic Integrated Disease Surveillance and Response (eIDSR) platform. Additionally, a phone call was made to Medical Teams International (MTI), an NGO supporting refugee settlement in the region, requesting Emergency Medical Services (EMS) for the suspected cases. Interviews with the surveillance team revealed that several key factors enabled this timely and effective response:
"Our knowledge of the existing alert management system, including the 6767 platform and eIDSR, allowed us to respond promptly," stated a member of the surveillance team.
"The availability of the necessary tools and resources, such as case definitions and guidelines, ensured we had the right information to act on the alert," remarked another team member.
"The clear communication and reporting channels from the Elegu refugee reception center to the district-level surveillance team facilitated the rapid notification during the outbreak," added the DSFP.
Response: The response to the potential cholera outbreak was initiated immediately on the same day the index case was detected at the Elegu Point of Entry (PoE). The District Rapid Response Team (RRT) was swiftly deployed to investigate the situation, collect laboratory specimens, and initiate treatment while evacuating the suspected cases.
“Some of the response team members have recently had training as frontline field epidemiologists, these were very resourceful as we mounted the response,” said the District Health Officer (DHO).
The outbreak was detected, and authorities were notified within a single day. Furthermore, by day 5 of the outbreak, all response pillars had been functionalized (Table 3).

Table 3: Calculated Timelines within the 7-1-7 Period: Imported Cholera Outbreak at Elegu, Uganda-South Sudan Border, January 2024

Interval	Calculation In days	Timeliness In days	Target In days	Met target? Yes/No
Detection	Difference between dates of emergence and detection	1	7	YES
Notification	Difference between dates of detection and notification	1	1	YES
Response	Difference between dates of notification and completion of the last early response action	5	7	YES

Continued from page 64

Discussion

This study assessed an imported cholera outbreak in Uganda, highlighting the preparedness and challenges associated with cross-border outbreak management in the country. Thirteen refugees traveling from South Sudan to Uganda were diagnosed with cholera, 6 hours after they arrived at the Elegu point of entry. The authorities were able to detect, notify, and respond to the outbreak within the stipulated timelines as per the 7-1-7 Metric, and no significant bottlenecks were identified in the response to this outbreak.

Our findings indicate that the case-patients were exposed to cholera during their stay in Ruweng town, most likely on the day of departure since it marks the first day among the 5 days of incubation. The outbreak in Ruweng was reportedly imported from Sudan, which had experienced a cholera outbreak since September 2023, with over 10,000 cases and more than 290 deaths [19, 20]. Cholera importation is not uncommon, as shown by several studies [21, 22]. Ugandan districts near the border have been at the highest risk of such cholera outbreaks. A study on cholera surveillance in Uganda found that cholera was persistently occurring in the northwestern border districts of the country [6]. We recommend that all asylum seekers coming from regions with ongoing outbreaks should be thoroughly screened and vaccinated at the border point.

This assessment highlights the vulnerability of asylum seekers specifically and immigrants in general to cholera and other waterborne diseases during their displacement and migration. A study on cholera prevention and control in refugee settings found that these outbreaks consistently involved inadequate water chlorination, a lack of sanitation facilities, and improper disposal of cholera waste [23]. Refugees may encounter different strains of cholera or other pathogens along their journey, which may require different prevention and treatment strategies. Therefore, it is essential to provide adequate water, sanitation, and hygiene (WASH) facilities, health education, and oral cholera vaccines (OCV) to asylum seekers and other displaced populations, especially in areas with endemic or epidemic cholera [23, 24].

In this study, we describe the use of the 7-1-7 metric for reporting on the timeliness of outbreak response, which was designed to align with and support the implementation of the International Health Regulations (IHR), specifically, the capacities at the community or primary public health response level, intermediate public health response level, and national level [13, 17]. We found that for the imported cholera outbreak at Elegu, the Uganda-South Sudan border point in January 2024, the authorities were able to detect, notify, and respond to the outbreak within the stipulated 7-1-7 timelines. Prompt response initiation was observed, with the outbreak being detected and notified within 1 day. However, it's also important to note that this was a relatively smaller outbreak containing a few cases without secondary cases, which could have facilitated this exceptional performance.

According to the 7-1-7 metric, the authorities responding to the outbreak, met the targets for detection, notification, and reporting [13]. These were done in 1:1:5 days, compared to the set target of 7:1:7 days respectively [16]. This performance can be attributed to the recent experience of both Ebola and COVID-19 outbreaks. The outbreak found the district with an existing and functional Regional Emergency Operations Centre (REOC), trained frontline health workers, and a response structure with clear pillars and terms of reference [25].

The fact that the frontline health workers at the district and the reception center had had some training in surveillance show that disease detection capacities must continue to be developed at both public and private health facilities, as most events are detected by health workers outside the public health system. A study done in Uganda comparing both private and public facilities capacity to detect disease outbreaks further highlighted this need [26]. Clear communication and reporting channels between health workers and surveillance officers are crucial to verifying events and initiating a larger public health response [16]. The analysis revealed that the most frequent response bottlenecks such as resource limitations and the availability of countermeasures, at the district level were not significant issues during this outbreak. However, the national-level and partner support resources to augment these gaps were a major enabling factor in the response.

These insights underscore the importance of strengthening disease detection and response capacity at the local level while ensuring effective coordination and resource mobilization at the national level to support a comprehensive and time

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ly outbreak management strategy. Our analysis indicates that the 7-1-7 target is achievable during outbreak management and highlights the importance of continued system strengthening.

Study limitations
The reliance on qualitative interview data is a key limitation of this assessment, as information gathered through interviews can be subject to potential biases, selective memory, and incomplete recollection of events.

Conclusion
In conclusion, this study on the imported cholera outbreak at Elegu, the Uganda-South Sudan border point in January 2024, demonstrates the preparedness and challenges associated with cross-border outbreak management in Uganda. Despite the initial detection of 13 cases among refugees arriving from South Sudan, the authorities were able to respond within the stipulated 7-1-7 timelines, highlighting the country's capacity to manage such outbreaks. The prompt detection, notification, and response were facilitated by the recent experience with Ebola and COVID-19 outbreaks, as well as the availability of a functional emergency operations center and trained frontline health workers. However, the findings also underscore the need to continue strengthening disease detection capabilities at the local level, improving communication between health workers and surveillance officers, and ensuring adequate resource mobilization at the national level to sustain an effective and comprehensive outbreak management strategy, especially for larger events.

Recommendations
Based on the findings, we recommended several actions to prevent and control cholera among asylum seekers and other vulnerable populations. Firstly, the surveillance and response systems for cholera and other diarrheal diseases should be strengthened in the affected areas, including the refugee collection centers and border points, potentially through regular screening of all incoming refugees. Secondly, mass vaccination campaigns with oral cholera vaccine (OCV) should be conducted for both the refugee and host communities, particularly in high-risk areas or where outbreaks are ongoing. These multi-faceted interventions targeting surveillance, sanitation, and vaccination can help mitigate the risk of cholera outbreaks among these vulnerable populations.

Conflict of interest
The authors declare that they had no conflict of interest.

Authors' contributions
IS: participated in the conception, investigation, design, analysis, and interpretation of the study and wrote the draft bulletin; BK, RN, MN, and BK reviewed the report, reviewed the drafts of the bulletin for intellectual content and made multiple edits to the draft bulletin; BK, LB, and ARA reviewed the final bulletin to ensure intellectual content and scientific integrity.

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Food poisoning outbreak caused by *Aeromonas* bacteria at a funeral in Buyengo Town Council, Jinja District, Uganda, February 2024

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Summary

Background: *Aeromonas*, gram-negative toxin-producing bacteria, are emerging human pathogens for food poisoning, causing acute gastroenteritis with an incubation period of 12 hours-7 days. On February 15, 2024, Ministry of Health was notified of suspected food poisoning following a funeral in BuyengoTown Council (TC), Jinja District where seventy-two people developed gastrointestinal symptoms. We investigated to determine the cause, magnitude and risk factors for the outbreak to inform control and prevention measures.
Methods: We defined a suspected case as onset of abdominal pain and ≥1 of the following: diarrhea, vomiting or nausea in a resident/ visitor of BuyengoTC in Jinja District and Nawampiti Subcounty (SC) in Luuka District during February 11–22, 2024. We found cases through health facility records review and community case search; collected data using an interviewer-administered questionnaire on identified cases.
We conducted descriptive epidemiology and environmental assessments to generate hypotheses. We conducted an unmatched case control study among funeral attendees in the two most affected villages, and microbiology and toxicology laboratory tests on 20 case-patients and 14 environmental samples.
Results: We identified 65 case-patients; 5% case-fatality rate. Common symptoms included abdominal pain (100%), diarrhea (94%) and vomiting (51%); 34% reported fever. Sixty-one (94%) case-patients had attended a funeral in BuyengoTC. The epidemic curve revealed multiple peaks, about 12 hours apart corresponding to the different serving times for the case-patients at supper and breakfast. Most cases presented within 12-86 hours from Monday supper time and 2-70 hours from Tuesday breakfast at the funeral; median incubation period was 34 hours (range=12-211 hours). For both meals, beef soup served was topped-up with unboiled water and not properly re-cooked. Sixty-two percent of the cases compared to 38% of the controls ate beef stew at supper (OR=2.7; 95% CI=1.2, 6.2). Additionally, 97% of the cases compared to 40% of the controls ate leftover beef stew for Tuesday breakfast (OR=57; 95%CI=5.4, 600). The main source of water used at the funeral was 'Kabakubya' stream. *Aeromonas hydrophilia* and *Aeromonas caviae* were isolated in the gastric aspirate from one of the case-patients, and the water from the stream.
Conclusion: This was a point source food poisoning outbreak caused by consuming beef stew contaminated with *Aeromonas* at a funeral. The *Aeromonas* was traced to a nearby stream. Stopping the use of water from the stream and enhanced water, sanitation and hygiene interventions helped control the outbreak.

Background

Food poisoning, a common public health problem that can cause severe illness and death, occurs when two or more people get a similar illness after consuming the same contaminated food or drink (1) . It's estimated that food poisoning affects 600 million people, killing 420,000 every year globally (2). Food poisoning can be caused by various agents including biological, viral, natural toxin, and chemicals that can contaminate food during production, processing, distribution, or preparation (1, 3).

In Uganda, the most common food poisoning causes are bacteria such as Salmonella, *Escherichia coli (E. coli),* and *Staphylococcus aureus (S. aureus), Shigella, Campylobacter spp, Bacillus cereus (B. cereus),* and *Clostridium species (spp) (4-6)*. The bacteria exist in their natural environment such as water and can contaminate meat, eggs, dairy products, food and vegetables and cause large food poisoning outbreaks during social functions (4, 5). Bacterial food poisoning can be infectious, toxic or mixed in nature. The toxins can be produced in the food before ingestion (pre-formed toxins) or in the gut after ingestion (enterotoxins). Toxin-producing bacteria such *as E. coli, S. aureus, B. cereus, Clostridium,* and *Aeromonas* usually cause acute symptoms in a few hours (2-24hrs) and can mimic chemical and natural toxins (3).

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Aeromonas, gram-negative toxin-producing aquatic bacteria, are emerging human pathogens known to cause food poisoning including acute gastroenteritis and septicemia. Four species including *Aeromonas caviae*, *Aeromonas dhakensis*, *Aeromonas veronii*, and *Aeromonas hydrophilia* account for >96% of the incidents.

Food poisoning due to *Aeromonas* usually presents with abdominal pain or cramps, diarrhea which maybe bloody, vomiting, and nausea with or without fever; incubation period of 12 hours to 7 days (7-10). Some of the known risk factors for food poisoning include poor hygiene practices, inadequate cooking methods, improper food storage conditions, and lack of awareness among consumers.

On February 15, 2024, Ministry of Health was notified of a suspected food poisoning outbreak in the BuyengoTown Council (TC) in Jinja District. The alert followed several people from the town council, complaining of acute onset of abdominal pain and diarrhea. Many of the sick reported attending a funeral in Bukasami village, BuyengoTC in the preceding days. We investigated to determine the cause, magnitude and risk factors for the outbreak to inform control and prevention measures.

Methods

Outbreak area

The outbreak occurred in BuyengoTC in Jinja District, and the neighbouring Nawampiti SC in Luuka District respectively. The suspected funeral took place in Bukasami village, in BuyengoTC which borders Nawampiti SC to the north (Figure 1). The deceased was the head of household and area Muslim leader and the funeral lasted several days attracting a lot of attendees, mainly from BuyengoTC and Nawampiti SC. He was buried on Monday, February 12, 2024, one day after his death but a prayer ceremony was held on the following day. On both occasions, funeral attendees were served different foods and drinks at breakfast, lunch, and supper.

Case definition and finding

We defined a suspected case as onset of abdominal pain and ≥1 of the following: diarrhea, vomiting or nausea in a resident/ visitor of BuyengoTown Council (TC) in Jinja District and Nawampiti Subcounty (SC) in Luuka District during Feb 11 –22, 2024. A confirmed case was a suspected case with laboratory confirmation of causative agent in a clinical specimen.

We conducted case finding using record reviews at the three health facilities serving the affected area including one health center III, one general hospital, and a regional referral hospital. We also conducted active case search within the affected communities. We interviewed cases using a case investigation form and developed a line list. The case investigation form included information on demographic characteristics, clinical features such as the time of onset and duration, social history, foods and drinks taken on specific days and their source, any laboratory investigations done, treatment given, and outcomes.

Descriptive epidemiology

We conducted descriptive analysis of data from interviews with case-patients. We characterized cases by person, place, and time and possible exposures. Person characteristics included sex and age. We categorized age (in years) into six meaningful categories including 0-4 (younger children), 5-14 (older children), 15-24 (young persons), 25-39 (young adults), 40-59 (middle aged) and ≥60 (elderly). We used the 2023 population estimates from the Uganda Bureau of Statistics (UBOS) for Jinja and Luuka districts to calculate attack rates by sex, age group, subcounty and village (11). We constructed chloropleth maps using the Quantum Geographic Information System (QGIS) software to display attack rates by place. We used an epidemic curve to analyse the distribution of cases by time of symptom onset.

Case management

A treatment unit was established at Buwenge General Hospital, the main hospital for Jinja District. The hospital is located in Buwenge Subcounty which borders BuyengoTC, the epicenter of the outbreak. Suspected cases were evacuated to the hospital from the communities by the district and Red Cross health teams using ambulances.

While at Buwenge General Hospital, the case-patients were admitted for observation and management. The case-patients were treated mainly-with intravenous fluids to correct severe dehydration, and antibiotics including Ceftriaxone and Ciprofloxacin for suspected bacterial infection. Four of the case-patients were referred to Jinja

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Regional Referral Hospital for further management.

Environmental assessment
We observed the funeral site and interviewed several key informants including two widows of the late AM and one of the cooks. We also interviewed the local council chairpersons of Bukasami and Nawandyo villages and household heads/caretakers of the deceased case-patients. Interviews focused on circumstances surrounding AM's death, burial practices, source of water, foods prepared at the funeral, the food preparation and handling processes. We also searched for any dumped leftover food at the funeral site. We collected water samples from the different sources of water used at the funeral, including four boreholes and 'Kabakubya" stream in Bukasami village.

Laboratory investigations
We collected both clinical and non-clinical samples from case-patients and the environment for laboratory testing. The clinical samples included one gastric aspirate, eight stool samples, 74 blood samples, and four urine samples from 53 case-patients. The non-clinical samples included four leftover food samples, piece of a soiled mattress used by one of the case-patients, and ten water samples. The water was collected from five water sources said to have been used during the funeral, and one jerrycan from the household where the funeral was held. The clinical and non-clinical samples including water samples were sent to Uganda's Central Public Health Laboratories (CPHL) for microbiology. Additionally, some clinical samples and the non-clinical samples such as leftover food were sent to the Directorate of Government Analytical Laboratory (DGAL) for toxicology screening.

Hypothesis generation
We conducted 65 interviews among case-patients that were identified through active case-search, including all the deceased. We also interviewed members of the district health team that were among the first responders, clinicians that attended to the case-patients, and the medical superintendent of Buwenge General Hospital where most of the case-patients were managed. We obtained data on social functions attended, the circumstances surrounding AM's death, funeral activities, foods and drinks taken prior to symptom onset, specific foods and drinks served at the funeral including the source, source of water used for cooking and hand washing, food preparation and handling during the funeral, clinical presentation of cases, and case management.
We used the results of the descriptive analysis of case-patient data, key informant interviews, and environmental findings to generate hypotheses.

Case Control Study
To test the hypotheses, we conducted an unmatched case-control study among the funeral attendees in the two most affected villages of Bukasami and Nawandyo in BuyengoTC and Nawampiti SC respectively. For each case-patient, we selected 3 control persons. A control was a resident or visitor to Bukasami and Nawandyo villages in BuyengoTC and Nawampiti SC, who attended the suspected funeral but had no history of abdominal pain, diarrhea or vomiting during February 11–22, 2024.

We used village house-hold lists to generate sampling frames per village and selected one control per household from the list of non-case households using simple random sampling. In total, 61 cases and 183 controls were selected. An interviewer administered questionnaire was administered to the eligible case-patients and control-persons to obtain information on their demographic, clinical characteristics, and foods and drinks taken at the funeral among others. We identified risk factors associated with the outbreak using logistic regression.

Ethical Consideration
This investigation was conducted in response to public health emergency by the National Rapid Response Team. The Ministry of Health Uganda provided administrative clearance to conduct this investigation. In addition, we received a non-research determination clearance from the US Centers for Disease Prevention and Control (US CDC). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy. § §See e.g., 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq. Furthermore, all the respondents gave individual verbal consent or assent for interviews since the investigation presented no more than

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minimal risk of harm and involved no procedures for which written consent is normally required in other contexts. We conducted the interviews in privacy to ensure confidentiality and the data kept under password protection by the study team.

Results

Descriptive epidemiology

Person and clinical characteristics of case-patients in a food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024 (n=65)

Overall, 65 case-patients were identified including one confirmed case; 5% (3/65) case-fatality rate. The confirmed case-patient had only taken leftover fried rice pre-mixed with leftover beef stew from the supper that was served on Monday, 12th February 2024. The leftover fried was carried home by the father from the funeral on Tuesday, February 12th 2024. The majority (52%) of case-patients were female. The median age was 20 years (IQR = 9-36) and most were aged 5-14 years (Table 1).

In addition to severe abdominal pain/cramps, the majority (94%) of the case-patients reported diarrhea and vomiting (51%). Fever was reported in only 34% of the case-patients. Among the non-specific symptoms, general body weakness was the commonest (63%) followed by headache at 42% (Figure 2). In 92% (60/65) of the case-patients, the first symptom was severe abdominal pain/cramps, with only 5% experiencing diarrhea as the first symptom. Among those with diarrhea, 25% had bloody diarrhea. Overall, females (AR=11/10,000) and males (AR = 10/10,000) were similarly affected. The elderly (≥60 years) (AR=27/10,000) were the most affected, while the 0-4 year age-group was least affected (Table 1).

Table 1: Attack rates by sex and age group during a food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

Variable	Population	Cases (%)	Attack rate/10,000
Sex			
Male	31600	34(52)	11
Female	30400	31(48)	10
Age (years)			
≥60	2170	6(9)	27
15-24	13516	16(25)	12
5-14	16988	22(34)	13
25-39	12028	11(17)	9.1
40-59	6882	6(9)	8.7
0-4	10416	4(6)	3.8
Median (IQR)		20 (IQR = 9-36)	

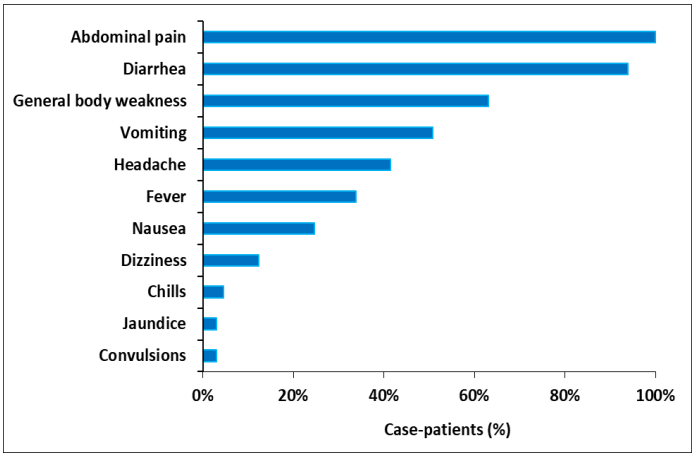

Figure 1: Clinical presentation of case-patients during a food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

Continues to page 72

Distribution of case-patients by time of symptom onset during the food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

The majority (94%) of the case-patients reported to have attended the funeral of AM, a prominent man in Jinja District who died on Sunday February 11, 2024. Funeral attendees started arriving on the same day, but no meals were served on that day. The following day on Monday February 12, 2024, at around 10:00 hours, funeral attendees were served breakfast with black tea and no accompanying food item. Later in the day, from 13:00-14:00 hours, the funeral attendees were served lunch with foods including: brown (fried) rice, white (boiled/unfried) rice, goat's meat and beef stew. Later on the same day, supper comprising brown rice and beef stew was prepared separately and served from 20:00-21:00 hours. However, one sauce pan containing brown rice that had been prepared for supper along with another containing leftover beef stew were kept and served to the funeral attendees at breakfast the following day, Tuesday February 13, 2024, between 8:00-10:00 hours. For both Monday supper and Tuesday breakfast, the beef stew was topped up with water to meet the high demand and was not properly re-cooked. We found that 94% (61/65) of the case-patients had attended the funeral, and 90% (55/61) had eaten either supper on Monday or breakfast served the following day using left-over food and beef stew from the previous supper (Table 2).

Case-patients started experiencing symptoms on Tuesday February 13 2024 at 08:00hrs. The epi-curve revealed multiple peaks with a time interval of about 12-24 hours between; suggesting a point source outbreak with multiple exposure times corresponding to the different serving times for the case -patients at supper and breakfast. Additionally, most of these cases presented within a time interval of 12-86 hours from when Monday supper was served and 2-70 hours from when breakfast was served the following day on Tuesday. The estimated median incubation period for case-patients was 37 hours (range = 12-185 hours) from their respective serving times for Monday supper and 27 hours (range = 0-211 hours) from their serving times for Tuesday breakfast. We noted that seven (11%) of the case-patients developed symptoms before or around the serving time for Tuesday breakfast but had taken supper at least 12 hours prior, suggesting that they had been exposed at supper time (Figure 2). In addition, all case-patients whose estimated incubation periods were less than12 hours from their breakfast serving time on Tuesday had also taken supper the previous day. Considering Monday supper as the earliest point of potential exposure, the overall median incubation period was estimated at 34 hours (range 12-211 hours) (Figure 2).

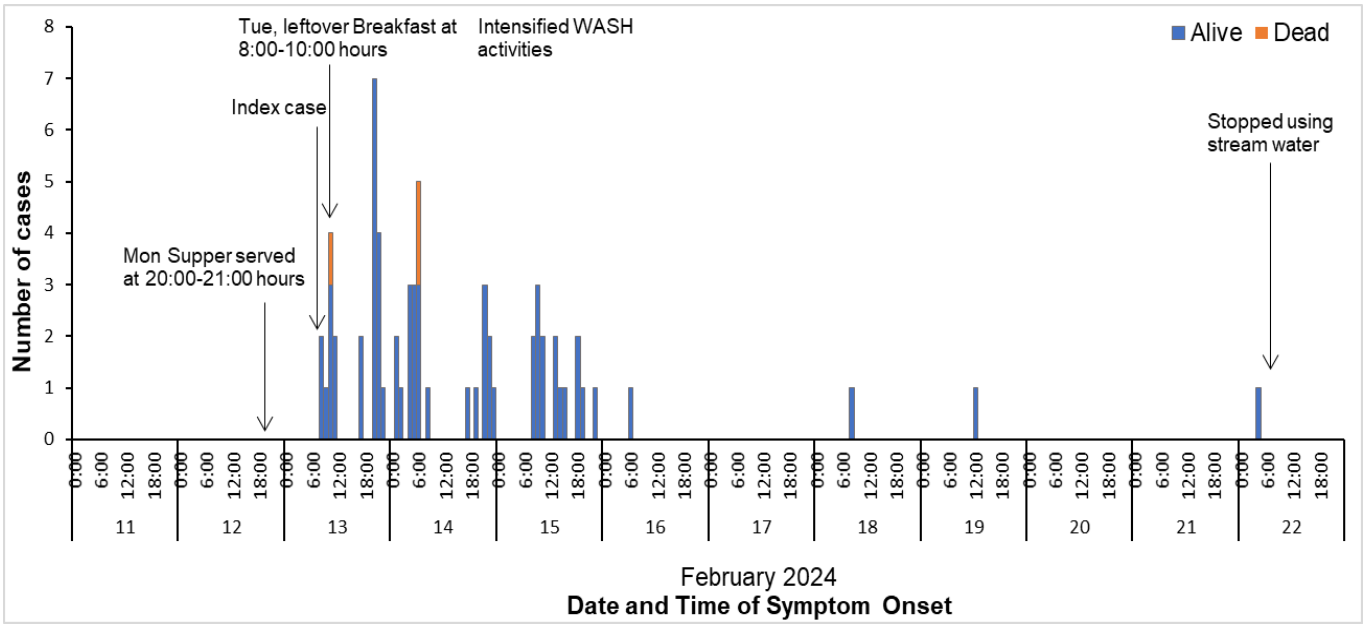

Figure 2: Distribution of case-patients by time of symptom onset during a food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

Continued from page 72

Attack rates by village and subcounty during a food poisoning outbreak caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

BuyengoTC in Jinja District (AR = 11/10,000) and Nawampiti Subcounty
(AR = 10/10,000) were similarly affected. However, Bukasami Village in BuyengoTC where the funeral was held was the most affected village (159/10,000) (Figure 3).

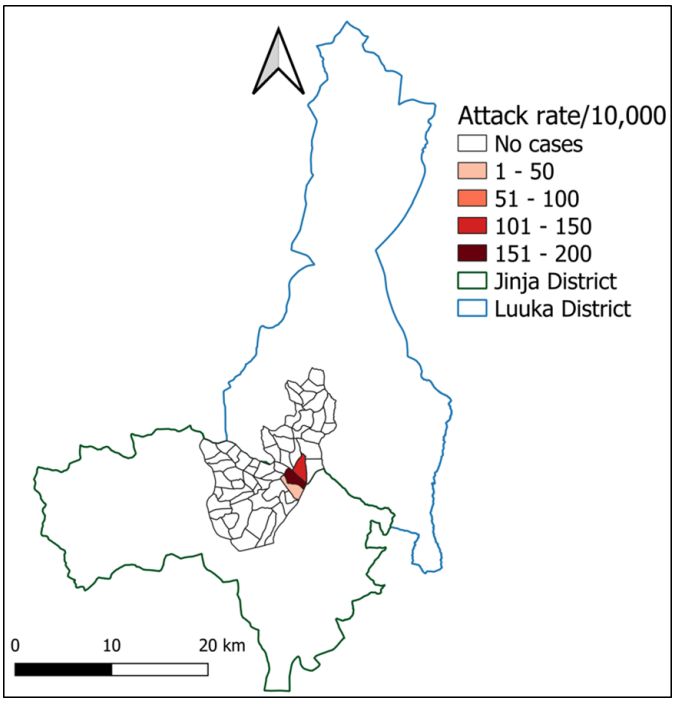

Figure 3: Attack rate by Village in BuyengoTC and Nawampiti SC during an outbreak of poisoning caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

Environmental findings

We found that whereas the main source of water routinely used by residents was the boreholes, most of the water used at the funeral was fetched from 'Kabakubya' stream using boda bodas and a pick-up motor vehicle. This was reported to have been necessitated by urgency and increased demand for water because the funeral attracted >1000 funeral attendees. We also found that unboiled water from 'Kabakubya' stream that was added to top-up the beef soup at Monday supper and the beef stew was not allowed enough time to be re-cooked. The beef stew was served with freshly prepared brown rice at supper on Monday and leftover brown rice from the same supper at breakfast the following day. It was reported that all the leftover brown rice served for breakfast was already pre-mixed with the beef stew.

Laboratory investigation findings

Aeromonas hydrophilia and Aeromonas caviae were isolated from the gastric aspirate of the deceased 4-year-old case-patient, revealing mixed infection by different strains of *Aeromonas* bacteria. Similarly, the water sample from Kabakubya water stream tested positive results for *Aeromonas hydrophilia by culture*. The leftover food samples tested negative on bacteriological culture and toxicology.

Hypothesis generation findings

We found that 61(94%) of the case-patients had attended AM's funeral on either Monday, February 12, 2024 or Tuesday, February 13, 2024 or both, and all had taken at least one meal at the funeral. Most (90%) of the case-patients had taken either Monday supper or Tuesday breakfast served with beef stew. The beef stew had been prepared at supper on Monday, February 12, 2024 but the leftovers were served at breakfast the following day (Table 2). It was reported that during both meals, the beef stew was topped up using water from a local stream to meet the demand from the funeral attendees, and was never properly recooked.

We thus hypothesized that the food that was served at either supper on Monday, February 12 or breakfast on Tuesday, February 13, 2024 was contaminated by an infectious causative agent. The agent was likely in the unboiled stream water that was used to top-up beef stew that was not properly re-cooked, and served at supper on Monday and as leftover breakfast the following day.

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Table 2: Potential exposures associated with food poisoning caused by *Aeromonas* bacteria, Jinja and Luuka districts, Uganda, February 2024

Potential exposure	Cases	Percentage
Attended AM's funeral (N=65)	61	94
Attended the funeral on Mon (N=61)	52	80
Attended on Tue-13 (N=61)	49	75
Ate any food at the funeral (N=61)	61	100
Ate any food onTue-13 (N=61)	47	77
Ate breakfast on Tue (N=47)	38	81
Ate Lunch on Tuesday (N=47)	25	53
Ate Supper on Tuesday (N=47)	23	49
Ate any food on Mon-12 (N=61)	44	72
Ate supper on Mon (N=44)	43	98
Ate Lunch on Monday (N=44)	21	48
Ate either Mon supper or Tue breakfast (N=61)	55	90
Took any drink at the funeral (N=61)	26	42
Attended the funeral on Wed (N=61)	14	23

Risk factors for food poisoning caused by *Aeromonas* bacteria among case-patients, Buyengo TC, Jinja District and Nawampiti SC, Luuka District, Uganda, February 2024

Eighty-six percent of the cases compared to 43% of the controls ate food at the funeral on Monday (cOR=7.2; 95% CI=3.2, 16.3). Similarly, 96% of the cases compared to 50% of the controls ate food at the funeral on Tuesday (cOR=24; 95% CI = 4.9, 112.6). Among those who ate food on Monday, 62% of cases compared to 38% of the controls ate beef at supper (aOR=2.7; 95% CI=1.2, 6.2). Furthermore, 97% of the case-patients compared to 40% of the control-persons ate leftover beef stew for Tuesday breakfast (cOR=57, 95% CI=5.4, 600).

An equivalent proportion of case-patients (97%) compared to control-persons (40%) ate leftover brown rice pre-mixed with the leftover beef stew for Tuesday breakfast (cOR=57, 95% CI=5.4, 600). However, eating brown rice at supper was not significantly associated with food poisoning (aOR=1.2, 95% CI=0.1, 11). Similarly, common reference group analysis also revealed that eating the brown rice without beef stew for Monday supper was not associated with food poisoning (aOR=2.6; 0.50,13) (Table 3). Dose-response analysis in the relationship between beef stew and food poisoning revealed no linear trend.

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Table 3: Risk factors for food poisoning caused by *Aeromonas* bacteria among case-patients, Buyengo TC, Jinja District and Nawampiti SC, Luuka District, Uganda, February 2024

Exposure	Cases (%)	Controls (%)	cOR (95% CI)	aOR (95% CI)
Ate any food at the funeral on Monday				
Yes	44(85)	65(43)	7.2 (3.2,16)	
No	8(15)	85(57)	Ref	
Ate any food at the funeral on Tuesday				
Yes	47(96)	17(50)	24 (4.9,112)	
No	2(4)	17(50)	Ref	
Ate beef stew for Mon supper				
Yes	26(62)	23(38)	2.6 (1.2,5.9)	2.7(1.2,6.2)
No	16(38)	37(62)	Ref	
Ate brown rice for supper on Monday				
Yes	36(86)	44(73)	2.2 (0.8,6.2)	1.2 (0.1,11)
No	6(14)	16(27)	Ref	
Ate brown rice with beef stew for supper on Monday				
Yes	22(54)	19(33)	2.4 (1.02,5.5)	
No	17(33)	35(67)	Ref	
Ate goat meat for supper on Monday				
Yes	1(2)	1(2)	1.4 (0.1,24)	
No	41(98)	59(98)	Ref	
Ate white rice for supper on Monday				
Yes	6(14)	16(27)	0.5 (0.2,1.3)	0.5 (0.052, 4.7)
No	36(86)	44(73)	Ref	
Ate leftover beef stew for breakfast on Tue				
Yes	38(97)	4(40)	57 (5.4,600)	
No	1(3)	6(60)	Ref	
Ate leftover brown rice for breakfast on Tue (all served with leftover beef stew)				
Yes	38(97)	4(40)	57 (5.4,600)	
No	1(3)	6(60)	Ref	
Took black tea at breakfast on Tuesday				
Yes	11(69)	13(59)	1.5 (0.39,5.9)	
No	5(31)	9(41)	Ref	

[#]cOR refers to crude Odds Ratio
*aOR refers to adjusted Odds Ratio, [*]Beef stew and brown rice pre-mixed beef stew eaten on Tuesday were not included in the multivariate models despite having a significant association with food poisoning at bivariate analysis, due to collinearity.

Discussion

Our investigation revealed a point source outbreak of food poisoning caused by *Aeromonas* bacteria in BuyengoTC in Jinja District and Nawampiti SC in Luuka District. Cases presented with symptoms of acute gastroenteritis, mostly severe abdominal pain/cramps and diarrhea, some of which was bloody.

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The overall case-fatality rate was 5% and the elderly people were the most affected age-group. The outbreak affected three neighboring villages and followed a funeral ceremony that was held for several days at Bukasami Village in BuyengoTC. Bukasami village, where the funeral was held was the most affected village.

We found that all case-patients had eaten at least one meal at the funeral either on the day of burial, Monday February 12, 2024 or the day after. Eating beef stew at Monday supper and/or leftover beef stew at breakfast on the following day was a risk factor for food poisoning. We found that the beef stew was contaminated with *Aeromonas* from the unboiled water that was added top up the soup without proper re-cooking. We traced the source of the *Aeromonas* to 'Kabakubya' stream from which most of the water used at the funeral was fetched.

Aeromonas are gram-negative, non-spore forming rods that live in aquatic environments worldwide (9, 10). Nineteen of the thirty-six known species are considered emerging pathogens to humans (8). Several studies have implicated *Aeromonas* species in causing food poisoning, wound infection and septicemia in several studies (7-10, 12). More than 96% of the incidents were caused by one of four species including *Aeromonas caviae*, *Aeromonas dhakensis*, *Aeromonas veronii*, and *Aeromonas hydrophilia* (8, 10, 13).

In this outbreak, the case-patients mainly experienced severe abdominal pain/cramps, and diarrhea in addition to vomiting. This symptom profile is consistent with the clinical features of acute gastroenteritis caused by *Aeromonas* bacteria. The bacteria are known to cause acute gastroenteritis with features including abdominal pain, diarrhea which maybe bloody or not, vomiting, nausea, and occasionally jaundice and dyspnea. The bacteria also produce enterotoxins and can cause severe symptoms in a short time including sepsis and death (8).

The bacteria have a low infective dose following natural exposure with a median dose of only 0.9 colony forming units (cfu) required for 1% illness risk (9, 10, 14). This infectious dose following natural exposure is thousand times lower than what has been estimated from challenge studies *(15)* . Studies have also found that the infectious dose for *Aeromonas* in diarrheal illnesses is comparable to that of well-known enteropathogenic bacteria such *as Campylobacter* and *Salmonella* species (8, 15). The gastric aspirate from the confirmed case-patient in this outbreak grew 3 cfu grown on culture, which was over three times the above median dose.

The estimated median incubation period of 34 hours and the range of 12-185 hours for 98% of the cases was consistent with the known incubation period for *Aeromonas* which ranges from 12 hours to 7 days (16, 17). Furthermore, most of the cases presented within two days from the potential exposure which is consistent with findings of a previous study in Bhutan in which 70% of the cases developed symptoms within 2 days of consuming beef stew from a carcass, contaminated with *Aeromonas* (12).

Contaminated water sources are an important source of *Aeromonas* (18). The most frequent route of entry of *Aeromonas* into humans is oral–fecal route, but the bacteria can also enter the body through wounds (9, 10, 14). Consumption of contaminated water and food are considered the main routes of transmission (19, 20). In this outbreak, case-patients consumed beef stew prepared using water from a stream which was subsequently found to contain *Aeromonas hydrophilia*. This was consistent with the known oral-fecal transmission of *Aeromonas* (20). Similarly, a food borne diarrheal disease outbreak investigation in a college in China found that students were exposed from consuming cucumber salads that had been rinsed with water contaminated with *Aeromonas* (21).

In this particular outbreak, we found mixed infection with *Aeromonas hydrophilia* and *Aeromonas caviae* in the gastric aspirate from the only confirmed case-patient. This particular case-patient was also among the three that died. Studies have shown that mixed infections by different *Aeromonas* species can occur and usually result into more severe disease as compared to when the infection is caused by a single species (8, 15). Whereas *Aeromonas* bacteria are known to infect both immunocompromised and immunocompetent people, the former are usually more affected. This explains why the attack rate was highest in the elderly.

The last case in this outbreak presented 10 days from the last potential point of exposure, beyond the typical incubation period of *Aeromonas*. However, studies have also found evidence of bacterial shedding by symptomatic and asymptomatic persons leading secondary transmission (8).

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Study limitations
Ongoing criminal investigations into the incident interfered with the investigation. Subsequently, we were unable to reach many of the cooks as they denied participating in food preparation due to fear of legal consequences. However, we were able to interview the main cook involved in preparing the implicated meals.

The investigation started four days later after the incident had occurred, and several visiting funeral attendees had already left the outbreak area and couldn't be reached for interviews. This might have underestimated the magnitude of the outbreak.

No food samples were collected from the suspected food particularly the beef stew. The only food samples sent for testing were found dumped at the funeral site one week after the incident, and weren't useful for microbiology. Nevertheless, they were still useful for toxicological investigations which were negative.

Conclusion
This was a point source outbreak of food poisoning in BuyengoTC and Nawampiti SC in Jinja and Luuka districts respectively caused by consuming beef stew that was contaminated with *Aeromonas* at a funeral. The source of the *Aeromonas* was the unboiled water from 'Kabakubya' stream that was added to top-up the beef soup at Monday supper and Tuesday breakfast. We recommended stopping the use of water from 'Kabakubya' stream and enhancement of WASH interventions to prevent secondary transmission and mitigate the risk of future outbreaks.

Public health actions
We disseminated the findings to Jinja District Task Force (DTF), and leaders of the affected communities. Subsequently, the DTF resolved to enhance Water and Sanitation, and Hygiene (WASH) interventions in the affected villages including distribution of chlorine water treatment tablets to all households and replenishing chlorine dispensers at all the water collection points.

Recommendations
We recommended the following measures to control the outbreak and mitigate the risk of future foodborne disease outbreaks.

Stopping the use of water from 'Kabakubya" stream indefinitely, since it was untenable to treat the stream water at source, and yet the village had several alternative safe water sources such as boreholes and pumped water tap systems.

Conducting community sensitization on causes and prevention of food poisoning with emphasis on personal hygiene, sanitation, food preparation and handling practices to prevent secondary cases and the risk of future foodborne disease outbreaks.

Intensifying and sustaining WASH interventions in the affected villages such as provision of chlorine for water treatment, encouraging people to boil drinking water and ensuring proper disposal of feces to halt further transmission of *Aeromonas*.

We also recommended refresher training of the district and health facility surveillance teams on food poisoning outbreak investigation. This would facilitate timely detection and proper response in any future outbreaks of a similar nature.

We also recommended orientation of the clinical teams on proper investigation, and management of food poisoning to avoid missed opportunities for identifying the causative agents in case of future outbreaks.

Conflict of interests
The authors declare that they have no conflict of interests.

Authors' contributions
YN, IS, DA, BK, SSM, YM, GO, PB, and THN, designed the study and contributed to the data collection and analysis. YN led the writing of the manuscript. YN, BK, RM, LB, and ARA participated in bulletin writing and review to ensure scientific integrity and intellectual content. All the authors contributed to the final draft of the bulletin.

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gency Operations Centre for their technical support and the US CDC for funding this investigation.

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World Health Awareness Days, and International Health Days, July -September 2024

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Introduction

Global public health awareness days are intended to raise awareness, publicity, and profile of particular diseases or conditions among the general population. Every year, different organizations and communities actively promote and support World Health Days globally.

World Population day -11th July

The World Population day is observed on 11th July every year to raise awareness of global population issues. The world population is estimated at 9.8 billion by 2050. Furthermore, population rise is associated with increased conflicts, wars, ecological degradation, and pandemics. There is therefore need to practice adequate family planning to control this population growth and every woman and man are called upon to cooperate for this cause.

World Hepatitis B disease day- 28th July

On 28th July every year, we commemorate the World Hepatitis B disease day, to raise its awareness among people in the world, and ultimately adopt the prevention mechanisms. Globally, over 90% of people are not aware they have a Hepatitis B Virus infection until in the late stages of the disease. Over 254 million people globally have Hepatitis B viral (HBV) infection and Uganda contributes 4.3% on this burden. Hepatitis B, is the leading cause of liver cirrhosis and liver cancer in Uganda. Transmission of HBV infection is through contact with blood or other body fluids of an infected person, mainly via vertical transmission from mother to child, sexual contact and sharing of sharp or piercing equipment. The disease is incurable and its case fatality rate is rapidly increasing globally and nationally. To prevent acquisition of Hepatitis B disease, there are available Hepatitis B vaccines given in 3 doses 1 month apart, and the last dose after 6 months, to both Hepatitis B negative children and adults. On this note, it's important to always test for this infection to ensure immediate prevention practices, early treatment, and improve prognosis.

World Breastfeeding week 01 Aug- 07 August

Every year from 1st – 7th August, we globally celebrate the World Breastfeeding week, with different themes each year. The theme for breastfeeding this year is to close the gap and support breast feeding for all mothers. This is aimed at ensuring equity for all breastfeeding mothers, especially the vulnerable ones by promoting the enabling environments that help women to breastfeed – including support in the community and the workplace, with adequate protection by government policies and laws, as well as sharing information on breastfeeding benefits and strategies. Breast feeding is the number one strategy to boost children's health status right from birth to at least 6 months of age, ultimately reducing neonatal and under 5 mortality rates.

World Suicide Prevention Day-10th September

On 10th September every year, the World Suicide Prevention Day (WSPD) is organized by the International Association for Suicide Prevention (IASP) and World Health Organization, to raise awareness around the globe that suicide can be prevented. This day aims to reach out to all individuals with suicidal tendencies, reducing stigma and restoring their hope in life. Every 2 years a new theme is created to guide the discussion on the day. The theme of 2021-2023 focused on Creating Hope Through Action' which was centered on encouraging understanding, reaching in, and sharing experiences in order to give people the confidence to take action. Globally, about 700,000 deaths are by suicide, and since it's a mental health problem, it needs to be addressed urgently to avert these deaths.

World Patient Safety day- 17th September

On 17th September every year, we commemorate the World Patient Safety day with a theme. This year, 2024 the theme is "Improving diagnosis for patient safety" to highlight the critical importance of correct and timely diagnosis in ensuring patient safety and improving health outcomes. When a correct diagnosis is given, disease management becomes easier and prognosis improves, ultimately improving patient's lives and longevity.

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World Rabies Day- 28th September

On 28th September every year, we observe the World Rabies Day to raise awareness of the consequences of human and animal rabies and how to prevent it. Rabies disease is transmitted to humans from animal bites. Rabies disease claims about 60,000 human lives each year. The disease is prevented by vaccinating all domestic dogs, and vaccinating humans with anti-rabies vaccine when bitten by any dog. Increased surveillance on unvaccinated pets and health education on responsible pet ownership are emphasized on this day.

Outbreak Response by the Uganda Public Health Fellowship Program, April-June, 2024

The Public Health Fellowship Program has responded to several outbreaks as part of the rapid response team and suggested recommendations per outbreak investigation as follows.

Cholera outbreak, Kasensero Town Council, Kyotera District: 8th- 17th May 2024

The outbreak was confirmed on 26th April 2024 by the Ministry of Health, and the investigation occurred during 8th to 17th May 2024 where 64 suspected,18 confirmed and 2 deaths were registered. The outbreak was caused by drinking contaminated water from Lake Victoria, that was contaminated by human fecal matter washed down into the lake, following flooding along the lake shores. Recommendations included; consumption of safe drinking water after chlorination or boiling and proper disposal of human waste in recommended pit latrines.

Measles outbreaks, Terego and Kakumiro Districts: 27th- 31st May 2024

PHFP fellows responded to measles outbreaks in Leju Town council, Terego District and 6 subcounties in Kakumiro District, namely: Kisengwe, Kasambya, Kakumiro Town council, Katikara, Bwanswa, Mwitanzigye. Over 150 suspected cases, 4 confirmed and no deaths were registered during the Terego measles outbreak, 30th April-01 June 2024. In Kakumiro District, over 180 suspected cases and 1 death have been identified since 7th April 2024 and as of 12th June 2024, the outbreak was still ongoing. In both districts, preliminary investigations indicated that the outbreaks were likely due to inadequate Measles/ Rubella vaccination for children less than 5 years leading to diminished herd immunity, lack of isolation centers for case-patients, and congestion in households. Preparations are underway to conduct mass Measles/Rubella vaccinations in the most affected sub-counties spearheaded by UNEPI. Construction of isolation centers at selected health facilities and community sensitization is also ongoing.

Anthrax outbreak, Amudat District: 11th June 2024 to-date

MoH outbreak notification was on the 25th March 2024. Investigations commenced on 11th June 2024 and active case finding was on-going as of 12th June 2024.

Polio outbreak in Mbale City, May 31 2024

Ministry of Health confirmed a Polio outbreak in Mbale city on May 31,2024. This outbreak is caused by a vaccine-derived polio virus type 2(VDPV2) that was isolated from a sewage plant during the routine sentinel environmental surveillance in Doko, Mbale city. Outbreak investigations are on-going and as of 12th June 2024, no human cases have been identified.