Counting deaths in Uganda: history, challenges, and what is currently being done amidst COVID-19 Pandemic

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Summary

Background and methods: The COVID-19 pandemic has led to a dramatic loss of human life and has been an unprecedented challenge to public health service delivery. One challenge has been identifying COVID-19-specific mortality in Uganda because of limited testing capacity. In addition, the disruption of societal and health systems caused by the epidemic contributes to deaths from other causes. All-cause mortality surveillance before, during and after a pandemic can help in understanding the true impact of COVID-19 on mortality. The Uganda Rapid Mortality Surveillance Project commenced from November, 2020 to-date to strengthen mortality surveillance at both health facility and community level. Rapid mortality surveillance (RMS) Informs decision makers about the full magnitude of the health consequences of pandemics with a focus on excess mortality. It enables real-time capturing and processing mortality data to enable monitoring of mortality trends to monitor population health and public health measures and contributes to the Civil Registration and Vital Statistics (CRVS) system strengthening efforts in order to ensure maximum benefit from routine data systems for policy and development. We conducted a descriptive analysis of the prospectively reported deaths in the RMS project database by age, sex, place and date of death to inform planning and interventions.

Results: By the 31st August, 2021, preliminary findings showed that 8,513 deaths had been reported from 1st January to 31st August 2021 from both health facility and community level. Of these,61% (5,209/8,513) were health facility reported and 39% (3,304/8,513) were community reported deaths. Of the 5,209-health facility reported deaths, 94% (4,896/5,209) had died from natural causes, 55% (2,850/5,209) were males, 25% (1,319/5,209) were in the age-group of 0-9 years. Majority of health facility reported deaths were reported by Fort

portal RRH 14% (723/5,209) and Hoima RRH 14% (713/5,209). A COVID-19 test was done on 19% (993/5,209) of the health facility reported deaths. Of the 993 health facility reported deaths that underwent a COVID-19 test, 69% (687/993) had a positive test by either PCR or Rapid Diagnostic Test. Among those that underwent COVID-19 test, the test positivity rate was 65% or higher for age-groups 30 years and above. For the 3,304 community reported deaths, 83% (2,753/3,304) had died from natural causes, 43% (1,437/3,304) were males, 73% (2,417/3,304) had died from home and 27% (885/3,304) had died from health facilities. COVID-19 test was done on 6.7% (223/3,304) of the community reported deaths. Of the 223 community reported deaths that underwent a COVID-19 test, 51% (114/223) had a positive test by either PCR or Rapid Diagnostic Test.

Conclusion: The project has succeeded in strengthening collection of real time mortality data at both health facility and community level. We recommend further collection of prospective data that will help to target, prioritize, monitor the effectiveness of prevention and response strategies for COVID-19 and other diseases in Uganda.

Background

Approximately half of all deaths in the world go unrecorded; thus, health policy decisions are often based on inadequate information(1). In Uganda, most deaths in health facilities go unreported to the National Identification and Registration Authority (NIRA), and an even smaller proportion of deaths in the community are reported(2). According to World Bank estimates, the crude death rate in Uganda was 6.5 deaths per thousand in 2018(3). There are few data about the causes of death by age, sex, date of death, place of death, and place of usual residence at either the health facility or community level(4). The COVID-19 pandemic has led to a dramatic loss of human life and has been an unprecedented challenge to public health service delivery(5). One challenge has been identifying COVID-19-specific mortality in Uganda because of limited testing capacity(6). Furthermore, the disruption of societal and health systems caused by the epidemic contributes to deaths from other causes(6, 7). All-cause mortality surveillance before and during the pandemic can help in understanding the true impact of COVID-19 on mortality, thus predicting the mortality of any other pandemic. Rapid mortality surveillance is a system for generating daily or weekly counts of all-cause mortality by age, sex, date of death, place of death, and place of usual residence. Rapid mortality surveillance helps to count both deaths that have occurred at health facilities and in the community to provide accurate, timely, and reliable mortality data(8). Mortality

surveillance helps identify the leading cause(s) and circumstances of deaths to guide immediate and future prevention strategies. Counting of deaths in Uganda has been conducted for a few conditions/diseases, such as maternal mortality; the practice has been restricted mainly to health facilities(9). Most importantly, the mortality data have not been aggregated into one system for easy monitoring and to establish cause-specific mortality rates.

The Uganda Rapid Mortality Surveillance (RMS) project, which commenced on 1st November 2020 will contribute to the reduction in the mortality surveillance related challenges Uganda is currently facing. The project is being implemented by two key implementers, the Ministry of Health (Uganda National Institute of Public Health [UNIPH] & Division of Health Information) and the National Identification and Registration Authority (NIRA). The key funders of the project include the Government of Uganda, Africa Centers for Disease Control and Prevention, CDC Foundation and Bloomberg Philanthropies Data for Health Initiative. The project is aimed at establishing a rapid mortality surveillance system that captures at health facility and community levels daily and weekly counts of all-cause mortality by age, sex, date of death, place of death, and place of usual residence to establish the impact of COVID-19 by evaluating excess mortality attributable to the pandemic. At health facility level, the project is being implemented at the 15 Regional Referral Hospitals (RRH) in the country putting into consideration regional representation that include: Arua, Gulu, Lira, Soroti, Moroto, Mbale, Jinja, Masaka, Hoima, Mubende, Fort portal, Mbarara, Kabale, Naguru and Entebbe. One medical records officer was trained from each RRH hence a total of 15 trained focal persons. The Regional Referral Hospital Focal Persons collect data on death events that have occurred within their respective RRHs and those brought in dead (BID)/dead on arrival (DOA) using a standard health facility based hard copy line list that is filled and updated on a daily basis. The line lists are remitted daily to the rapid mortality surveillance project coordinator and senior epidemiologist by email. The data sources used include: outpatients registers, inpatient registers, theatre registers, mortuary registers, death review reports and death notification reports.

At community level, the project is being implemented in 5 Ministry of Health regions that had registered the highest COVID-19 cases in the first wave of the pandemic in Uganda and these include: Lira, Kampala metropolitan, Masaka, Gulu, and Mbale. From each of these regions, 3 most affected districts were purposively selected making a total of 15 first phase

districts that include: Kayunga, Mukono, Wakiso, Lira, Dokolo, Oyam, Gulu, Amuru, Kitgum, Masaka, Kyotera, Rakai, Mbale, Tororo, and Kapchorwa. Thirty Parish Village

Health Team (VHT) coordinators were trained from each of the 15 Districts hence a total of 450 trained VHT coordinators. One district VHT coordinator was trained from each of the 15 districts making a total of 15 trained District VHT coordinators. Trained Parish (VHT) Coordinators collect data on any death alert in their areas of jurisdiction and enter in the standard community line list. The data source used include: next of Kin or immediate caretakers of the deceased. Data is remitted as a short death notification message to the mobile tracking (mTrac) system of the Ministry of Health (MoH). Hard copies of the line list are picked by the District VHT Coordinators and submitted to the rapid mortality surveillance project coordinator and senior epidemiologist on a quarterly basis.

Baseline mortality data collection is also on going at both Regional Referral Hospitals and in the 15 first phase districts for 3 years (1st Jan 2018 – 31st Dec 2020). Data from the baseline assessment will be used to compute expected deaths. In addition to the data collection activities, the project central team conduct monthly review meetings with RRH focal persons and District VHT coordinators to highlight and make a way forward to the challenges faced during the data collection process at both RRHs and community level. On a weekly basis, analysis and dissemination of mortality data is done every Tuesday during weekly technical meetings. On a monthly basis, findings from the analysis are presented during the National Task force meetings to inform actions. We conducted a descriptive analysis of the prospectively reported deaths by age, sex, place and date of death to inform planning and interventions.

Methods

We conducted a descriptive analysis of the prospectively reported deaths captured in the rapid mortality surveillance data base from November, 2020 to 31 August, 2021. We described the deaths by age, sex, place and date of death. Frequencies and percentages were computed. We sought permission for using the data from the rapid mortality surveillance project management which owns the data. Data was kept in confidential and was only accessed and analyzed by the project staff.

Results

Over all, by the 31st August, 2021, the preliminary findings show that 8,513 deaths had been reported from 1st January 2021 to 31st August 2021 at both health facility and community levels. Of these, 61% (5,209/8,513) were health facility reported deaths and 39% (3,304/8,513) were community reported.

Table 1: Distribution of reported deaths, Uganda, January 2020-August 2021,

Variable	All reported deaths at RRHs N = 5,209	Had a COVID-19 test		COVID-19 test result (n=993)		
		Yes n (%)	No n (%)	Positive n (%)	Negative n (%)	Results not yet received n (%)
Sex						
Male	2,850 (55)	524 (19)	2,326 (83)	370 (71)	108 (21)	46 (9)
Female	2,301 (44)	468 (20)	1,833 (80)	316 (68)	91 (19)	61 (13)
Not recorded	58 (1)	1 (2)	57 (98)	1 (100)	0 (0)	0 (0)
Age group						
0-9	1,319 (25)	52 (4)	1,267 (96)	11 (21)	9 (17)	32 (62)
10-19	281 (5)	31 (11)	250 (89)	12 (39)	15 (48)	4 (13)
20-29	478 (9)	60 (13)	421 (88)	29 (48)	21 (35)	9 (15)
30-39	555 (11)	81 (15)	474 (85)	53 (65)	19 (23)	9 (11)
40-49	500 (10)	112 (22)	388 (78)	77 (69)	25 (22)	10 (9)
50-59	534 (10)	143 (27)	391 (73)	107 (75)	27 (19)	9 (6)
60-69	494 (9)	161 (33)	333 (67)	124 (77)	23 (14)	14 (9)
70-79	453 (9)	171 (38)	282 (62)	132 (77)	31 (18)	8 (5)
80+	436 (8)	127 (29)	309 (71)	126 (99)	1 (1)	0 (0)
Not recorded	159 (3)	55 (35)	104 (65)	17 (31)	3 (5)	35 (64)

Of the 5,209 health facility reported deaths, 94% (4,896/5,209) had died from natural causes, 55% (2,850/5,209) were males, 25% (1,319/5,209) were in the age-group of 0-9 years, followed by 11% (555/5,209) in the age group of 30-39 years while 8.4% (436/5,209) were in the age-group of 80+. (Table 1)

Table 2: Showing distribution of reported deaths at Regional Referral Hospitals

Regional Referral Hospitals	Frequency	Percentage
Entebbe	91	1.7
Moroto	94	1.8
Naguru	129	2.5
Jinja	190	3.6
Kabale	213	4.1
Gulu	229	4.4
Mbarara	321	6.2
Masaka	357	6.9
Mbale	363	7.0
Mubende	378	7.3
Arua	400	7.7
Soroti	469	9.0
Lira	539	10.3
Hoima	713	13.7
Fortportal	723	13.9
Total	**5209**	**100**

Majority of health facility reported deaths were reported by Fort portal RRH 14% (723/5,209) and Hoima RRH 14% (713/5,209) (Table 2). A COVID-19 test was done on 19% (993/5,209) of the health facility reported deaths. Of the 993 health facility reported deaths that underwent a COVID-19 test, 69% (687/993) had a positive test by either PCR or Rapid Diagnostic Test and the test positivity rate was 65% or more among age groups 30 years and above (Table 1).

For the 3,304 community reported deaths, 83% (2,753/3,304) had died from natural causes, 43% (1,437/3,304) were males, 73% (2,417/3,304) had died from home and 27% (885/3,304) had died from health facilities. COVID-19 test was done on 6.7% (223/3,304) of the community reported deaths. Of the 223 community reported deaths that underwent a COVID-19 test, 51% (114/223) had a positive test by either PCR or Rapid Diagnostic Test.

Discussion

We found that most of the deaths occurred at health facilities than in the community. Majority of the deceased both at health facility and community level died from natural causes and were males. Age group 0-9 years particularly, neonates was most affected among the health facility reported deaths while age group 80+ was most affected among the community reported deaths. The positivity rate among those who underwent a COVID-19 test at both health facility and community level was high and increased by age.

This analysis revealed that most of the reported deaths occurred at a health facility as compared to those that occurred at home. This may be explained by the fact that regional referral hospitals are high volume health facilities and have a catchment area of 2 million people(10). Most patients admitted in health facilities had severe COVID-19 and required specialized medical services such intensive care unit (ICU) which were not readily available. However, we our findings are in contrast to a study conducted in Burkina Faso, Ethiopia, and Nigeria that found barriers to healthcare access due to the pandemic(11). Our findings suggest that even though essential health services have been disrupted by the pandemic, people are still going to regional referral hospitals to seek care.

Secondly, majority of the deceased both at health facility and community level died from natural causes. This is expected for deaths that occur in the community because in most cases there is no medical examination or history taken(1, 12). However, for deaths that occurred at health facilities, it shows a lack of coding of the specific causes or factors contributing to death as prescribed by the International Classification of Diseases 11th revision (ICD-11)(13). Therefore, there's a need to scale up training and implementation of the ICD-11 module and certification of deaths at health facilities in Uganda that will directly feed into death registration information collected for civil registration and vital statistics by NIRA.

Thirdly, the age group 0-9 years, particularly neonates contributed the highest proportion of deaths at RRHs. This is expected because it is in line with 2019 estimates by United Nations Inter-agency group for child mortality estimation which show that Uganda still has high neonatal (20/1000), infant (33/1000) and under-five (45/1000) mortality rates per 1,000 live births(14). As expected, the mortality rate for the age group 5-9 years was a bit lower, estimated at 8.6 per 1000 children aged 5(14).

Additionally, the positivity rate among those who underwent a COVID-19 test at both health facility and community level was high at more than 50%. This may be explained by the

increase in testing volume as COVID-19 RDT kits became widely available in April 2021(15). This finding also shows the high burden of COVID-19 at both health facility and community level at the time. It provides evidence of widespread community transmission of COVID-19. This supports expansion of COVID-19 testing services to all those that need it and as well help with attribution of cause of death to COVID-19.

Lastly, for those who died at RRHs, the test positivity rate increased with age. Those who were 30 years and above had test positivity rates higher than 60%. This finding helps to highlight the nature of the COVID-19 pandemic in Uganda at the time. It is supported by results from other studies that found higher infection rates in older age-groups which in turn lead to higher chances of having comorbidities and worse outcomes like death(16-18). With these findings, the Rapid Mortality Surveillance project has met it's main objective which is to provide real time evidence-based information on overall mortality within the context of COVID-19 pandemic in Uganda. The RMS project data will help to give estimates of the number of deaths in excess of those expected in the absence of the SARS-CoV-2 epidemic that are highly correlated with the confirmed number of COVID-19 deaths over time(19). The project has succeeded in strengthening collection of real time mortality data at both health facility and community level.

Limitations

Despite the achievements, we were an unable to calculate the excess mortality caused by COVID-19 because we did not have complete mortality data before the pandemic. Baseline data collection is still ongoing and once complete expected deaths will be computed and compared with the observed deaths. We are also cognizant of the fact that the community level data is currently being collected from 30 districts representing only 5 regions whereas the data at health facility level is being collected from all the 15 regions in the country. This may limit the representativeness of the community level data.

Conclusion

The project has succeeded in strengthening collection of real time mortality data at both health facility and community level. Most of the reported deaths occurred at a health facility as compared to those that occurred at home. Majority of deaths at both health facility and community level were due to natural causes and were males. Age group 0-9 years specifically, neonates was most affected among health facility reported deaths while age

group 80+ was most affected among community reported deaths. The positivity rate among those who underwent a COVID-19 test at both health facility and community level was higher than 50% and for health facility deaths, it increased by age.

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