# Factors associated with severe malaria deaths: Lessons from mortality audit conducted in health facilities in Uganda

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## KEY MESSAGES

The Uganda case demonstrates that to reduce mortality attributable to severe malaria, there should be strengthening of systems and health worker practices. Actions should be guided by structured assessment of system capacity gaps and mortality audits.

## Introduction

Uganda is one of five countries that accounted for 50% of malaria cases globally in 2017.[1] The disease is one of the leading causes of morbidity and mortality in the country, with an incidence rate of 191 cases per 1,000 people and a mortality rate of nine deaths per 100,000 people.[2] As such, in 2016 the Ministry of Health (MoH) adopted clinical audit guidelines to improve the quality of severe malaria management in health facilities aiming to achieve 'near zero' deaths by June 2020.

Between 2017 and 2019, Malaria Consortium — under the MAPD project — used these guidelines to audit health facilities in 47 districts, with the view to identifying factors associated with malaria deaths to improve quality of care and avert deaths in those settings.

## Methods

- Purposive sampling of two regional referral hospitals (RRH) and one health centre (HC) that reported highest deaths in the 47 districts under project support.
- Assessment of data quality by comparing data in health management information system (HMIS) reports with inpatient and outpatient registers, against a 90% target for accuracy.
- A retrospective criteria-based review of health facilities' systems and case management practices, using clinical case notes and medical records (i.e. in-patient admission forms, registers and laboratory reports).
- Qualitative assessment of case management practices, using a mortality audit form adapted from WHO's line listing form and India's National Vector Borne Disease Programme form.
- On clinical and laboratory assessment as recorded in clinical case notes, a score of one was given to each expected complication per patient diagnosis, and frequency was computed by multiplying the number of patients by the number of complications assessed.
- Manual data analysis in Excel and descriptive statistics.

## Results

Overall, data quality was poor:

- Only 62% of inpatient and outpatient registers and 30% of HMIS reports were accurate.
- Deaths were underreported: 43 reported versus 56 actual.
- Only 61% of those who had died (34) had had a laboratory test for malaria, of whom 76% (26) had tested positive.
- None of those who died had a confirmed bacterial infection (e.g. pneumonia).

### Table 1: Score on quality attributes for health facility systems for severe malaria management

| Systems standards | Hoima RRH | Fort Portal RRH | Bujubuli HC |
|---|---|---|---|
| **A. Health facility functionality** | **Minimum target → ≥80%** | | |
| Health facility staffing | 100 | 100 | 100 |
| Triage systems and equipment | 90 | 75 | 57.5 |
| Consultation room presence | 100 | 100 | 100 |
| Consultation room equipment and staffing | 57 | 84 | 54 |
| Resuscitation presence room | 100 | 100 | 100 |
| Resuscitation equipment, staffing and medicines | 52 | 54 | 34 |
| Laboratory presence and equipment | 92 | 72 | 100 |
| Presence of a high dependency area, clinical staff, medicines and supplies | 57 | 69 | 0 |
| **Total** | **81** | **82** | **68** |
| **B. Competence/practice assessment** | | | |
| Availability, knowledge and adherence to case management guidelines | 58 | 47 | 63 |
| Triage practice | 100 | 80 | 80 |
| Resuscitation room practice | 78 | 100 | 0 |
| Treatment practices for malaria, pneumonia and diarrhoea | 100 | 79 | 78 |
| Laboratory practice | 100 | 100 | 93 |
| Pharmacy store and dispensing standards | 100 | 100 | 100 |
| Medicine available | 74 | 64 | 86 |
| Stock-outs did not last more than three days in the last three months | 66 | 36 | 76 |
| **Total** | **85** | **76** | **72** |

### Table 2: Summary of scores on clinical assessment for complications*

| Diagnosis syndrome identified from records | Anaemia | Convulsion | Diarrhoea | Dyspnoea | Bleeding | Oliguria /anuria | Jaundice | Altered sensorium | Coma | Freq. score | Aggregate score % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Severe malaria (n= 12) | 2 | 0 | NA | NA | NA | NA | 0 | 0 | NA | 48 | 4 |
| Severe malaria and hypoglyceamia (n= 4) | 2 | 0 | NA | NA | NA | NA | 0 | 4 | 0 | 20 | 30 |
| Severe malaria and severe anaemia (n= 33) | 33 | 6 | NA | 0 | 0 | NA | 0 | NA | NA | 165 | 24 |
| Severe malaria, shock and acute kidney failure (n= 2) | 1 | NA | 0 | NA | NA | 1 | NA | 2 | 0 | 10 | 40 |
| Cerebral malaria (n= 1) | 0 | 0 | NA | 0 | NA | 0 | NA | 1 | 1 | 6 | 33 |
| Severe malaria, severe anaemia and cardiac failure (n= 1) | 1 | NA | NA | 0 | NA | 0 | NA | NA | NA | 3 | 33 |
| Severe malaria, severe pneumonia and severe dehydration (n= 4) | 0 | NA | 4 | NA | NA | 0 | NA | 0 | NA | 16 | 25 |
| Severe malaria, anaemia and pneumonia (n= 3) | 3 | NA | NA | 3 | NA | NA | NA | NA | NA | 6 | 100 |
| Severe malaria and convulsions (n= 5) | 2 | 5 | NA | NA | 0 | NA | NA | 0 | 0 | 25 | 28 |
| **Total achieved** | **44** | **11** | **4** | **3** | **0** | **1** | **0** | **7** | **1** | | |
| Sum total | 57 | 55 | 6 | 40 | 38 | 8 | 49 | 30 | 12 | | |
| Percentage | 77% | 20% | 67% | 8% | 0% | 13% | 0% | 23% | 8% | Average | 35 |

*Not applicable or not relevant assessment for the diagnosis

### Table 3: Aggregate score on completeness of diagnostic investigation

| Test type | Hoima RRH | Fort Portal RRH | Bujubuli HC |
|---|---|---|---|
| | Percentage (target = 100%) | | |
| Malaria test | 64 | 46 | 77 |
| Tests for complications | 54 | 50 | 18 |
| Test for differential diagnosis | 50 | 30 | 56 |
| **Average** | **56** | **42** | **50** |

### Table 4: Proportion of patients' treatment according to national treatment guidelines

| n= 56 | Intravenous artesunate | Intravenous quinine | Combined antibiotic | Other |
|---|---|---|---|---|
| | Percentage | | | |
| Hoima RRH | 53 | 6 | 37 | 4 |
| Fort Portal RRH | 63 | 21 | 38 | 0 |
| Bujubuli HC | 62 | 31 | 23 | 4 |
| **Average** | **59** | **17** | **33** | **3** |

## Conclusion

- Care quality for severe malaria is sub-optimal due to a variety of factors including weaknesses in service delivery systems and in health worker performance. Only 26 deaths with a positive test could have died of malaria-related causes. Inadequate identification of the complications of malaria and their management, as well as a lack of confirmation of diagnosis, appear to be contributory factors. Programmes aiming to reduce malaria attributable deaths in health facilities should explore interventions at systems for emergency or intensive care and health worker skills to identify and manage complications.
- This presentation of lessons from implementation is not an empirical scientific study. Hence, it cannot comment on the causal relationships between variables.

**For more information**
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