RESEARCH ARTICLE

Malaria management in children with fever in rural Sierra Leone. Has anything changed after the Ebola outbreak? [version 1; peer review: awaiting peer review]

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Abstract

Background: Sierra Leone is one of the highest malaria burden countries in the world and was severely affected by the 2014-15 Ebola outbreak. As fever is a common symptom of both malaria and Ebola, it might have affected the management of fever in children. Among under-fives in Koinadugu district, Sierra Leone, we determined fever cases that had malaria diagnostic testing and treated with Artemisinin-based Combination Therapy (ACT) during pre-Ebola, intra-Ebola and post-Ebola periods.

Methods: The study population included all children under five with fever who presented to 68 primary healthcare facilities in Koinadugu district. Malaria management was in line with national guidelines. All individuals presenting with fever should be subjected to a malaria diagnostic test, which may involve a Rapid Diagnostic Test (RDT) or microscopy. Only confirmed malaria cases should receive ACTs. The study spanned pre-Ebola (June 1, 2013 – April 30, 2014), intra-Ebola (June 1, 2014 – April 30, 2015) and post-Ebola (June 1, 2016 – April 30, 2017) periods. Data were sourced directly from routine morbidity registers available at each health facility.

Results: In the 68 health facilities, fever cases increased from 43,245 pre-Ebola to 74,367 post-Ebola (1.7-fold increase). Diagnosed malaria ranged between 66% and 75%. Only 47% of malaria cases were treated during Ebola. ACT use was 95% pre-Ebola, 99% intra-Ebola and dropped to 71% post-Ebola. Post-Ebola, an average of 40 (59%) facilities had monthly stock-outs of ACT (range 28-45).

Conclusion: What has changed since the Ebola outbreak is the increased utilisation of services for malaria. However, ACT stockouts are of concern, and this requires attention in order to ensure compliance with national malaria treatment guidelines.
Keywords
Health Systems Strengthening, SORT IT, Sustainable Development Goals, Artemisinin Combination Therapy

This article is included in the TDR gateway.

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Author roles: Sesay JB: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Resources, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Denisiuk O: Conceptualization, Formal Analysis, Methodology, Software, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Hann K: Data Curation, Investigation, Project Administration, Writing – Original Draft Preparation, Writing – Review & Editing; Zacharialah R: Conceptualization, Formal Analysis, Funding Acquisition, Methodology, Software, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Moses FL: Conceptualization, Data Curation, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Writing – Review & Editing; Dumbuya U: Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The programme was funded by the Special Programme for Research and Training in Tropical Diseases hosted at the World Health Organization (TDR).

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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How to cite this article: Sesay JB, Denisiuk O, Hann K et al. Malaria management in children with fever in rural Sierra Leone. Has anything changed after the Ebola outbreak? [version 1; peer review: awaiting peer review] F1000Research 2019, 8:1792 (https://doi.org/10.12688/f1000research.18565.1)

First published: 23 Oct 2019, 8:1792 (https://doi.org/10.12688/f1000research.18565.1)
Introduction
A cross-sectional study conducted in 2017 involving 68 primary health facilities in Koinadugu district of rural Sierra Leone compared the management of children with fever for malaria for a period before, during and after the Ebola outbreak. There were two key findings. First, less than half of all confirmed malaria cases were treated for malaria during the Ebola outbreak. As fever is a common symptom of both malaria and Ebola, health workers may have “played safe” by simply referring such children to Ebola management sites.

Second, monthly utilization of malaria diagnostics closely matched the number of reported fever cases, implying that fever cases were being routinely subjected to malaria testing.

Although the post-Ebola period was included in this evaluation, it was for a relatively short period (six months) which was probably too soon to gauge health system recovery. At the primary healthcare level in the same district and among children under five, we thus performed a new analysis with a longer post-Ebola period and compared these data for similar periods before and during the Ebola outbreak. Our specific objectives were to determine: a) numbers of reported fever cases and malaria tests done, and b) numbers treated for malaria with artemisinin combination treatment (ACT) and within 24 hours of fever onset.

Methods
This was a cross-sectional study using routine program data. The setting has been previously described. The study population included all children under five who presented to 68 primary healthcare units. Malaria management was in line with national guidelines and has been described previously. In brief, all individuals presenting with fever to any given health facility were subjected to a malaria diagnostic test, which may involve a Rapid Diagnostic Test (RDT) or microscopy. Only confirmed malaria cases should receive ACT.

The study spanned a pre-Ebola (June 1 2013 – April 30 2014), intra-Ebola (June 1 2014 – April 30 2015) and post Ebola (June 1 2016 – April 30 2017) periods.

Data were sourced directly from routine morbidity registers available at each health facility. A data manager was responsible for data quality, and a dedicated data entry clerk performed data entry. We used EpiData software for data entry and analysis (version 4.1 for entry and version 2.2.2.182 for analysis; EpiData Association, Odense, Denmark).

Ethics approval was obtained from the Sierra Leone Ethics and Scientific Review Committee (dated 18 December 2018) and the Union Ethics Advisory Group (International Union against Tuberculosis and Lung Disease, Paris, France; EAG number 70/18). As we used aggregated data, the need for informed consent was waived by the ethics committees.

Results
Numbers of reported fever cases and malaria tests done
Table 1 shows the numbers of fever cases reported and malaria tests done during the pre-, intra- and post-Ebola periods (see underlying data). Fever cases increased from 43,245 pre-Ebola to 74,367 post-Ebola (1.7-fold increase). Diagnosed malaria among fever cases ranged between 66% and 75%. During Ebola, all diagnosed malaria cases had malaria tests, while in the pre- and post-Ebola periods, 99% received testing and 1% was diagnosed on clinical grounds.

Numbers treated for malaria in relation to ACT and fever onsets
Table 2 shows numbers treated for malaria in relation to ACT and timing of fever onset. While all diagnosed malaria cases received treatment in the pre- and post-Ebola periods, only 47% were treated during Ebola. ACT use was 95% pre-Ebola, 99% intra-Ebola and dropped to 71% post-Ebola. In the

<table>
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<tr>
<th>Table 1. Fever cases reported (suspected malaria) and malaria tests done during the pre-, intra- and post-Ebola outbreak periods at the primary healthcare level in Koinadugu District, Sierra Leone.</th>
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<tr>
<td>Reported fever cases</td>
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<td>(suspected malaria)</td>
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<td>Diagnosed with malaria</td>
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<td>Total</td>
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<td>Confirmed malaria</td>
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<td>Clinically diagnosed</td>
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1 Pre-Ebola (1st June, 2013 to 30th April, 2014); Intra-Ebola (1st June, 2014 to 30th April, 2015); Post-Ebola (1st June 2016 to 30th April, 2017)
2 Using Rapid Diagnostic Test or Laboratory-based Microscopy
3 Without Rapid Diagnostic Test or Laboratory-based Microscopy
Discussion
This study shows that despite the Ebola outbreak, the number of reported fever cases progressively increased and was 1.7 times higher post-Ebola compared to the pre-Ebola period.

Reassuringly, while less than half of malaria cases received treatment with ACT drugs during Ebola, in the post-Ebola period, all cases received treatment (which included ACT and other antimalarial drugs). ACT use declined from 99% during Ebola to 71% post-Ebola, and this was accompanied with ACT stock-outs. This could be explained by the increase in numbers needed to be treated for malaria in the post-Ebola period (2.8-times that during Ebola), which might have caused pressure on available ACT stocks and supply chains.

As part of Sierra Leone’s post-Ebola health recovery strategy, more health personnel were trained in surveillance and reporting, incentives were introduced, and community involvement was promoted. Operationally, this seems to have increased health service utilisation for malaria, but the health system seemed unable to cope with the increased ACT demand. This needs to be addressed in order to ensure compliance with national malaria treatment guidelines.

The main study strength is that we used data from all health facilities in the district and compared similar periods of time before, during and after the Ebola outbreak. A study limitation was the lack of data on complicated and uncomplicated malaria cases. Availability of such information would help to justify (or not) the use of other antimalarial drugs apart from ACT which was seen in the post-Ebola period. A short-coming in the district health information system (DHIS2) is that it does not capture severity of malaria (complicated and uncomplicated malaria). Adding this variable would improve monitoring of rational use of antimalarials.

In conclusion, what has changed since the Ebola outbreak is the increased utilisation of services for malaria. However, ACT stockouts are of concern, and this requires attention in order to ensure compliance with national malaria treatment guidelines.

Data availability
Source data
Original, hard-copy data is accessible through consultation with the Ministry of Health and Sanitation’s District Health Management Team, Kabala, Koinadugu, Sierra Leone, led by Dr Kwame O’Neill, District Medical Officer (shakoneill@yahoo.com).

Underlying data

This project contains the following underlying data:
• Sesay_F_malaria_data.csv (CSV file contain Koinadugu district child malaria data)
• Sesay_F_malaria_datadictionary.csv (Data dictionary for Sesay_F_malaria_data.csv)

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).
Acknowledgements
This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership coordinated by the Special Programme for Research and Training in Tropical Diseases at the World Health Organization (WHO/TDR) and implemented with partners. The training model is based on a course developed jointly by the International Union Against Tuberculosis and Lung Disease (The Union) and Medécins sans Frontières (MSF). The specific SORT IT programme which resulted in this publication was jointly developed and implemented by: WHO/TDR, the Sierra Leone Ministry of Health and Sanitation, WHO Sierra Leone and the Centre for Operational Research, The Union, Paris, France; Alliance for Public Health, Ukraine; Institute of Tropical Medicine, Antwerp, Belgium; and Sustainable Health Systems, Freetown, Sierra Leone.

References

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