



Impact of infectious disease epidemics on tuberculosis diagnostic, management, and prevention services: experiences and lessons from the 2014–2015 Ebola virus disease outbreak in West Africa



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SUMMARY

The World Health Organization (WHO) Global Tuberculosis Report 2015 states that 28% of the world's 9.6 million new tuberculosis (TB) cases are in the WHO Africa Region. The Mano River Union (MRU) countries of West Africa—Guinea, Sierra Leone, and Liberia—have made incremental sustained investments into TB control programmes over the past two decades. The devastating Ebola virus disease (EVD) outbreak of 2014–2015 in West Africa impacted significantly on all sectors of the healthcare systems in the MRU countries, including the TB prevention and control programmes. The EVD outbreak also had an adverse impact on the healthcare workforce and healthcare service delivery. At the height of the EVD outbreak, numerous staff members in all MRU countries contracted EBV at the Ebola treatment units and died. Many healthcare workers were also infected in healthcare facilities that were not Ebola treatment units but were national hospitals and peripheral health units that were unprepared for receiving patients with EVD. In all three MRU countries, the disruption to TB services due to the EVD epidemic will no doubt have increased *Mycobacterium tuberculosis* transmission, TB morbidity and mortality, and decreased patient adherence to TB treatment, and the likely impact will not be known for several years to come. In this viewpoint, the impact that the EVD outbreak had on TB diagnostic, management, and prevention services is described. Vaccination against TB with BCG in children under 5 years of age was affected adversely by the EVD epidemic. The EVD outbreak was a result of global failure and represents yet another 'wake-up call' to the international community, and particularly to African governments, to reach a consensus on new ways of thinking at the national, regional, and global levels for building healthcare systems that can sustain their function during outbreaks. This is necessary so that other disease control programmes (like those for TB, malaria, and HIV) are not compromised during the emergency measures of a severe epidemic.

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1. Introduction

The World Health Organization (WHO) Global Tuberculosis Report 2015 states that 28% of the world's 9.6 million new

tuberculosis (TB) cases are in the WHO Africa Region, where the annual case detection rates are more than double the global average of 133 per 100 000.¹ TB incidence has continued to fall by an average of 1.5% per year since 2000 and is now 18% lower than the level during the year 2000.¹ Gains made by TB control programmes need to be sustained, and an upward trajectory of investments into activities of TB diagnostic, treatment, and prevention services is required to bring TB under control.² To this

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end, the Mano River Union countries (MRU; Guinea, Sierra Leone, and Liberia) and other West African countries have made incremental and sustained investments into TB control programmes over the past two decades.¹ However, the devastating Ebola virus disease (EVD) outbreak of 2014–2015 in Guinea, Liberia, and Sierra Leone,^{3–5} which claimed an estimated 11 310 lives and affected 28 616 people, impacted significantly on all sectors of the healthcare systems,^{4–14} including the TB prevention and control programmes.^{4,6,9,11,13} In this viewpoint, the direct and indirect impacts of the EVD outbreak on various aspects of TB diagnostic, management, and prevention services are highlighted.

2. Lack of community education and public engagement

Media hype during any epidemic outbreak usually and inadvertently creates stigma and fear-driven responses among the affected communities. The EVD outbreak was no different.^{15–17} Right from the onset, due to misconstrued conspiracy theories that were propagated by the local media and community gossip about the perceived origin of Ebola virus (EBV), the EVD outbreak was characterized by community fear, stigma, apprehension, and misunderstanding of the role of healthcare centres operating under prevailing epidemic conditions.^{15–17} Where these perceived fears outweighed potential benefits, the creation of Ebola treatment centres further hindered healthcare-seeking behaviour.^{16,17} There was widespread reluctance of people with symptoms such as fever to visit healthcare facilities for fear of being diagnosed or suspected of having EVD. People also refrained from visiting healthcare facilities to avoid being infected with EBV. There was also heightened anxiety amongst some healthcare workers (HCWs) to engage with or treat patients,¹⁸ and many healthcare facilities in all three countries were closed during the outbreak.

Several indicators of poor utilization of healthcare facilities and services during the EVD outbreak have emerged. In Guinea, there was a 50% decrease in outpatient visits and a 54% drop in hospital admissions between August 2013 and August 2014.⁶ In Liberia, 62% of health facilities were closed, and there was a 50% drop in hospital deliveries and a 26% drop in child immunizations.⁶ In Bong County in Liberia, facility-based delivery decreased from over 500 per month to a low of 113 during the EVD outbreak.⁷ In Sierra Leone, only 4% of health facilities were closed, but there was a 39% drop in children treated for malaria and a 23% decrease in facility-based deliveries.⁷ Furthermore, there was an 18% decrease in women accessing antenatal care, 22% decrease in women accessing postnatal care, and 11% decrease in deliveries at healthcare centres, with a concomitant 30% increase in maternal deaths and 24% increase in newborn deaths.⁸

3. Impact of the EVD outbreak on TB services and management outcomes

The EVD outbreak impacted all sectors of the healthcare systems, decreasing healthcare capacity in all three countries, including the TB prevention and control programmes. Whilst EVD caused an estimated 11 000 deaths in 2014 and 2015, TB claimed about 11 900 lives in all three countries in the year 2014, with Sierra Leone estimated to have had 3500, Liberia 3300, and Guinea 5100 TB-related deaths.¹ Of the deaths from TB, about 2164 (95% confidence interval (CI) 1815–2548) in Sierra Leone, 3463 (95% CI 2808–4349) in Guinea, and 2164 (95% CI 1815–2548) in Liberia were estimated to have been influenced by EVD.⁹

Moreover, the mortality rate for TB from 1990 to 2012 was 23 per 100 000 in Guinea, 143 per 100 000 in Sierra Leone, and 46 per 100 000 in Liberia.¹ In 2014, which formed the learning curve and peak of the EVD outbreak, the mortality rate in Guinea

doubled to 43 per 100 000, and in Liberia it rose to 76 per 100 000 with Sierra Leone having 56 per 100 000. Some of these deaths would have been preventable if routine TB care and prevention efforts had been fully operational during the EVD outbreak.

The three MRU countries combined had over 400 DOTS centres (directly observed treatment services), which ensured testing for new and recurrent cases of TB, provided treatments, and monitored adherence. In Kenema District, Eastern Sierra Leone, for example, the DOTS centre at the Government Hospital in Kenema did routine testing for TB, admitted TB patients for treatment, and provided daily drugs for TB patients who had to come to the hospital daily for their TB regimen, except for those who were adherent. During the EVD outbreak, two HCWs at the DOTS centre contracted EVD and died. Inpatients at the DOTS centre discharged themselves, patients who were on regular chemotherapy avoided the clinic, and prospective TB patients also avoided the healthcare system. Even though the DOTS centre was not closed, its functionality was impaired by the quarantine and patient boycott. The patient boycott in Kenema was related to how Ebola was reported in the District.

In Liberia, DOTS centres were among the 62% of health facilities that were closed during the EVD outbreak.⁷ DOTS centres are also typically healthcare facilities that could be peripheral health units or hospitals. While it was difficult to close big hospitals completely during the EVD outbreak, it was easier to close down peripheral health units, some of which were DOTS centres in the MRU, and this hampered TB diagnosis, treatment, and adherence.

In Guinea, in the forested region of Macenta, a 40% drop in primary healthcare outpatient enrolment and a correlated 53% decrease in TB diagnosis rate was reported in one study.¹⁰ However, in Conakry, Ortuno-Gutierrez and colleagues reported a stable TB prevalence rate of 13% in both 2013 (when there was no documented EVD in Guinea) and 2014 (when there was an ongoing EVD outbreak in Guinea).¹¹ The two datasets, one from a more rural region with typically less access to healthcare and smaller facilities and the other from a very urban setting, demonstrate that the impact of EVD on the healthcare system was not symmetrical. Facilities that were far from the capital cities experienced much more reduced care during the outbreak.^{10,11}

4. Effect of EVD on routine childhood BCG vaccination

The EVD epidemic disrupted healthcare services, including routine childhood vaccination programmes.¹⁹ The WHO guidelines for immunization programmes during the Ebola outbreak advised against vaccination campaigns because of the threat of EBV transmission.²⁰ Vaccination against TB with BCG in children under 5 years of age was affected adversely by the EVD epidemic. Many parents were gripped with fear, wary of the healthcare centres and possibility of EBV transmission, and avoided vaccination clinics and hospitals. Reasons for boycotting the clinics were varied and included: (1) that children were weighed using the same scales without these being disinfected in-between children, and (2) HCWs had died after contracting EVD in the clinics and hospitals. Others believed the conspiracy theories about EBV transmission that 'the injections received at hospitals contained EBV for killing patients' or that 'when you visit the hospital, they will diagnose you with Ebola'. As a consequence, over 3000 children missed essential vaccinations for TB and other diseases such as measles, which resulted in an outbreak of measles post-Ebola¹⁹ and a rise in new TB cases post-Ebola.

5. Effect of EVD on access to, and delivery of healthcare services

The EVD epidemic generated disruptive collateral damage to all ongoing healthcare services.^{4–14} A large proportion of available

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