

Effect of HIV Status on Tuberculosis Load as Detected by Xpert MTB/RIF in Sputum vs. Saliva Samples

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Abstract

Tuberculosis (TB) is the most common co-infection among people living with HIV, but HIV positivity is associated with a lower Mycobacterium tuberculosis (MTB) bacillary load in sputum, making TB often difficult to diagnose with current diagnostic solutions.

GeneXpert MTB/RIF (Cepheid, USA), a rapid, molecular diagnostic assay, has transformed the TB diagnostic landscape and can be used to diagnose TB and limited drug resistance in HIV patients from direct clinical samples in < 2 hours, but results can be significantly affected by sample bacterial load, which is quantified by the GeneXpert MTB/RIF (Xpert) instrument using Ct values.

Our primary objective was to assess how a patient’s HIV status affected their MTB bacterial load in sputum vs. saliva samples submitted for Xpert diagnosis of TB.

Upon mean Ct value comparison, sputum samples contain a significantly higher bacterial load on average compared to saliva samples independent of HIV status.

Introduction

Myanmar ranks among the 30 highest TB burden countries as classified by the World Health Organization (WHO) and has one of the highest rates of TB/HIV coinfection in the world.

Through the recent incorporation of a national network of Xpert MTB/RIF machines, a rapid, point of care (POC) molecular diagnostic test that detects the presence of *Mtb* and rifampin resistance (RIF), the Myanmar NTP has increased testing and diagnosis of TB and multidrug resistant TB (MDR-TB).

Materials and Methods

We completed a retrospective analysis of >4,000 patient records from the Myanmar National TB Program captured as part of a nation-wide electronic reporting system developed with the assistance of FIND (Geneva).

De-identified records included HIV status, Xpert testing results, and for a subset of patients, specimen type.

With this diagnostic information, we compared the distribution of MTB load (quantified by Xpert Ct values) in sputum and saliva in HIV positive vs. HIV negative patients using STATA/SE 16.1 (Stata Corp, College Station, TX, USA).

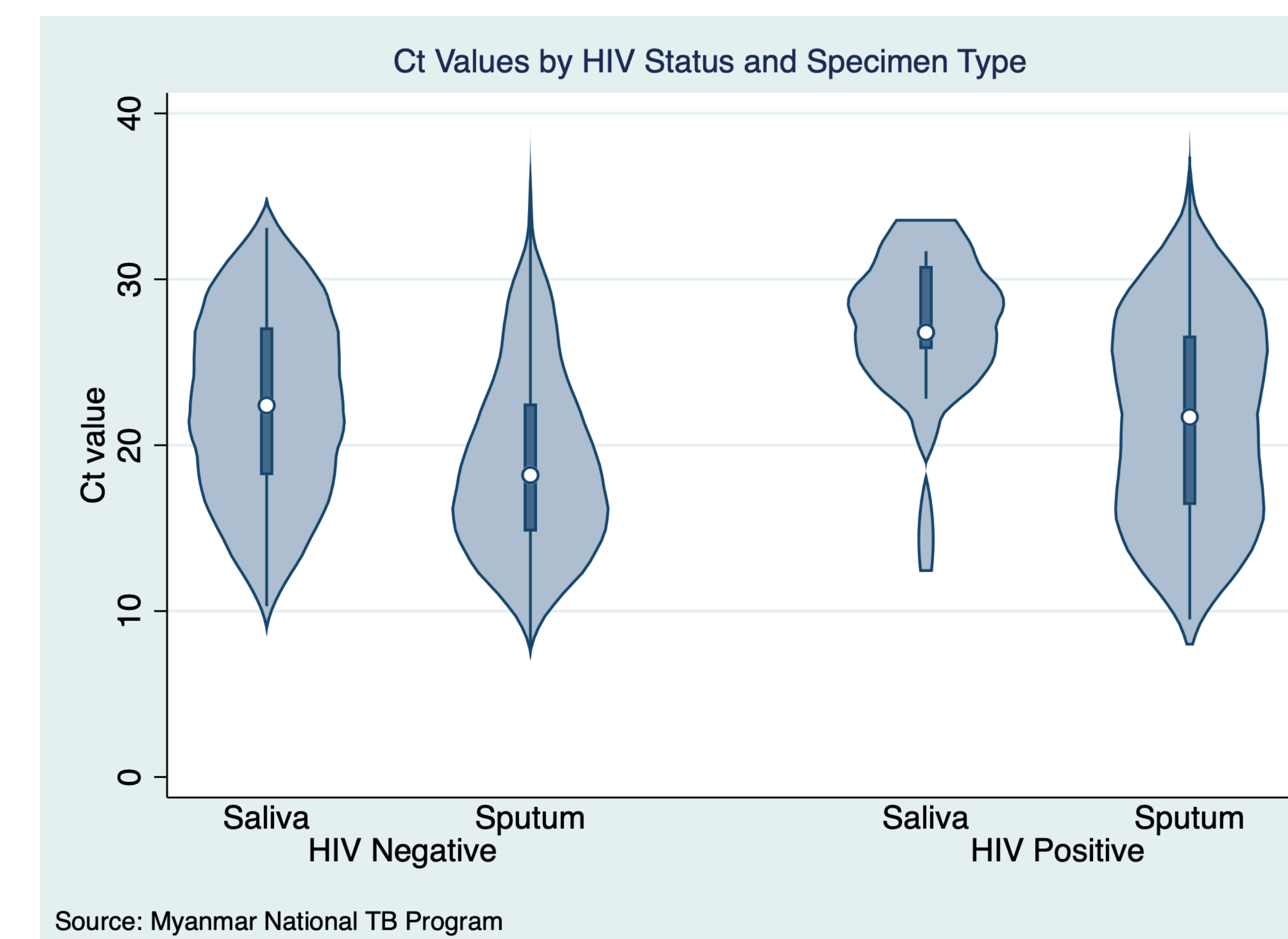
Results

Based on mean Ct value comparison independent of HIV status, saliva samples (mean Ct = 22.7) contained a significantly lower bacterial load of *Mtb* as compared to sputum samples (mean Ct=19.2, p < .001).

Within saliva samples, a lower bacterial load was also detected in HIV positive patients (mean Ct = 26.9) compared to HIV negative patients (mean Ct = 22.3, p < .05).

Similarly, in sputum samples, a lower bacterial load was detected in HIV positive patients (mean Ct = 21.6) compared to HIV negative patients (mean Ct = 19.0, p < .001) (Figure 1).

Table 1 illustrates the demographics of the study population stratified by HIV status. While >4,000 records were used for the sputum vs. saliva comparison, the overall database was comprised of over 300,000 records. HIV positive individuals were significantly younger than individuals whose HIV status was negative or unknown.



Source: Myanmar National TB Program

Figure 1. Ct Values by HIV status and specimen type.

Conclusion

Sputum samples have a significantly higher bacterial load on average compared to saliva samples independent of HIV status. Additionally, when looking at both saliva and sputum as sample types, HIV positive patients have significantly lower bacterial load than individuals who are HIV negative. Based on these results, sputum is the optimal sample type for Xpert TB detection, especially in people living with HIV.

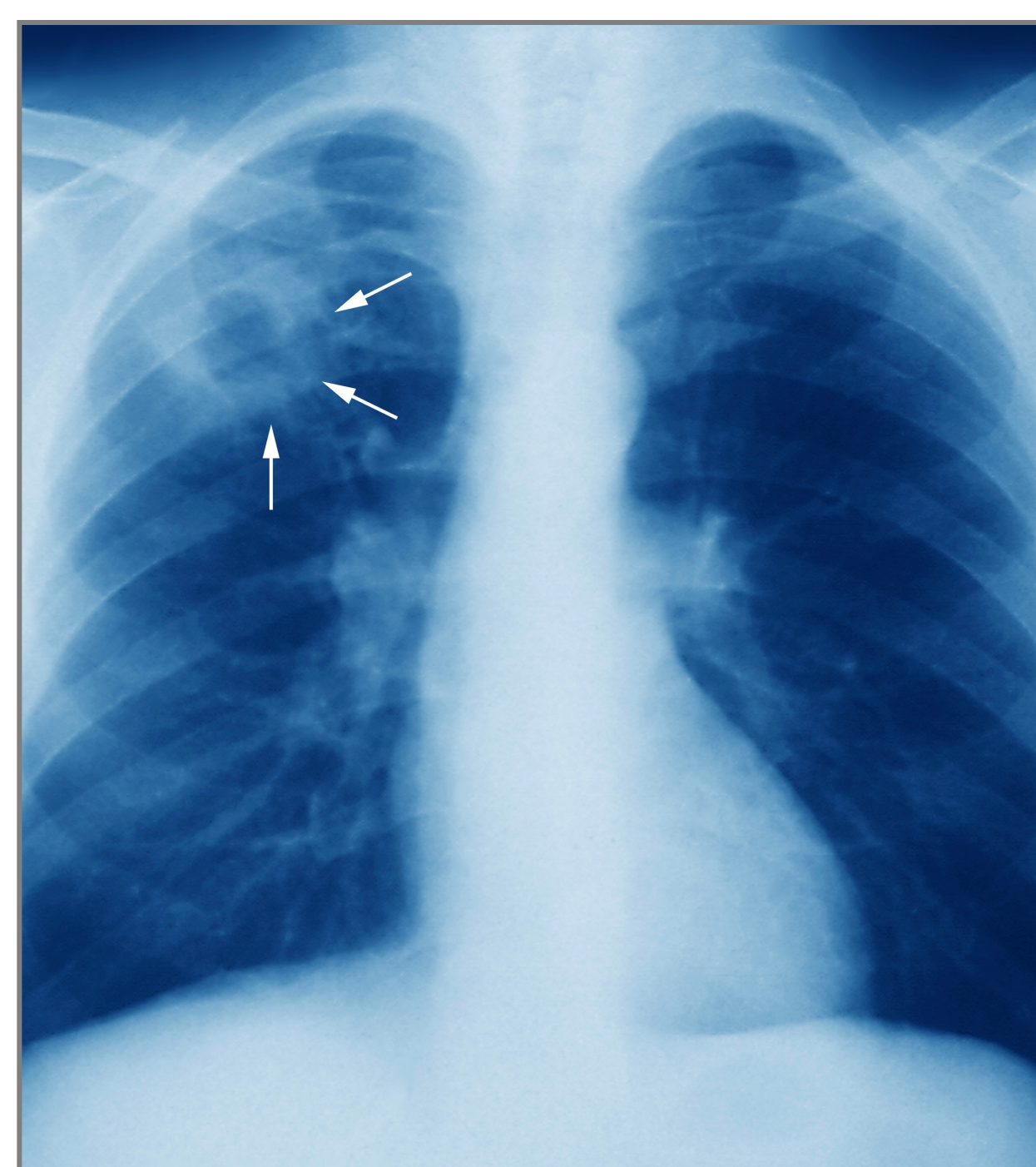
Overall, our results demonstrate the success of the Myanmar NTB and emphasize the importance of using Xpert MTB/RIF to detect TB among PLHV, who have significantly lower bacterial loads in their samples compared to HIV negative individuals.

References

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Xpert MTB/RIF. Point of care molecular assay.



Pulmonary Tuberculosis. X-ray diagnostic of TB.

	HIV Positive	HIV Negative	HIV Unknown
Xpert MTB/RIF <i>Mtb</i> Positive Result	13,975 (23.8)	74,820 (55.0)	60,928 (42.2)
Mean Age (IQR)	36.87 (30-44)	45.34 (32-59)	46.03 (32-60)
Sex			
Female	19,199 (32.8)	44,811 (33.1)	50,067 (35.8)
Male	39,419 (67.2)	90,511 (66.9)	89,674 (64.2)

Table 1. Characteristics of the study population stratified by HIV status.