Delayed diagnosis and treatment of tuberculosis in HIV+ patients in Mozambique: a cost-effectiveness analysis of screening protocols based on four symptom screening, smear microscopy, urine LAM test and Xpert MTB/RIF

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Abstract

BACKGROUND

Tuberculosis (TB) represents the ninth leading cause of death worldwide. In 2016, are estimated 1.3 million TB deaths among HIV negative people and an additional 374,000 deaths among HIV positive people.In2016, are estimated 1.4 million new cases of TB in people living with HIV (PLWH), 74% of whom were living in Africa. In light of these data, the reduction of mortality caused by TB in PLWH is strongly required specially in low-income countries as Mozambique. According to international guidelines, the initial TB screening in HIV+ patients should be done with the four symptoms screening (4SS: fever, current cough, night sweats and weight loss). The diagnostic test more used in resource-limited countries is smear microscopy (SMEAR). World Health Organization (WHO) recommended Lateral Flow urine LipoArabinoMannan assay (LF-LAM) in immunocompromised patients; in 2010 WHO endorsed the use of Mycobacterium Tuberculosis/Rifampicin (MTB/RIF) test for rapid TB diagnosis but the assay is not used as screening test in all HIV+ patients irrespectively of symptoms due to cost and logistical barriers.

The paper aims to evaluate the cost-effectiveness of three screening protocols: standard (4SS and SMEAR in positive patients to 4SS);*MTB/RIF*; *LF-LAM / MTB/RIF*.

METHODS

We developed a model to assess the cost-effectiveness of the *MTB/RIF*protocol versus the common *standard* and *LF-LAM / MTB/RIF* protocol. The model considered a sample of 1,000 HIV+ antiretroviral treatment naïve patients in Mozambique. We evaluated disability-adjusted life year (DALY) averted for each protocol, cost per DALY, and incremental cost-effectiveness ratio (ICER), over 1-year, assuming a national healthcare system perspective.The model considered the delayed diagnosis and treatment as the time elapsed between the a false negative test and the diagnosis of TB. On top of that there is a possible health system delay defined as the time interval between positive test and treatment initiation due to the a delay in the delivery of results due to weaknesses in the organization of services. We conducted a sensitivity analysis on more relevant variables.

RESULTS

The MTB/RIF protocol was cost-effective as compared to the standard protocol with an ICER of $56.54 per DALY saved. In a cohort of 1,000 patients MTB/RIF and LF-LAM / MTB/RIF protocol generated 1,281 and 1,254 DALY's saved respectively, with a difference of 174 and 147 DALY respect to the standard protocol.

The total cost of MTB/RIF protocol was lower ($92,263) than the standard ($147,226) and the LF-LAM / MTB/RIF protocol ($113,196).

Therefore, the cost per DALY saved including new infections due to delayed diagnosis and treatment with the standard protocol was $79.06, about 5 fold higher than MTB/RIFand LF-LAM / MTB/RIF protocols.

The cost of new and additional TB infections due to delays in diagnosis plus health system delay

seemed the more relevant costs in our analysis.The low sensibility and sensitivity of the standard protocol led to a high number of false negatives, thus delayed TB diagnoses and treatment lead to the development of newly transmitted TB infections.
CONCLUSIONS
Our study shows that the MTB/RIF adoption could lead an increasing of TB case-finding and a reduction in costs compared with standard and LF-LAM / MTB/RIFprotocols

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