Tuberculosis and human immunodeficiency virus co-infection and clinical significance of non-tuberculous mycobacteria in western Kenya

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ABSTRACT

Tuberculosis and human immunodeficiency virus co-infections have a global prevalence with high morbidity and mortality rates. Non-tuberculous mycobacteria have emerged as opportunistic pathogens among human immunodeficiency virus / acquired immunodeficiency syndrome patients. Ziehl Neelsen smear microscopy initially used in the diagnosis of tuberculosis fails to differentiate between tuberculous and non-tuberculous mycobacteria. This cross-sectional study was carried out between 2007 and 2009 at one provincial, one Level 5 and eight district hospitals in western Kenya to determine the performance of Ziehl Neelsen smear microscopy and culture in the diagnosis of tuberculosis among human immunodeficiency virus / acquired immunodeficiency syndrome patients. It sought to determine the prevalence of tuberculosis and human immunodeficiency virus infection, and tuberculosis - human immunodeficiency virus co-infection rate in western Kenya. It also sought to determine the clinical significance of non-tuberculous mycobacteria in western Kenya, and the correlation between human immunodeficiency virus co-infection and resistance of *Mycobacterium tuberculosis* to first-line anti-tuberculosis drugs isoniazid, rifampicin, streptomycin and ethambutol. Sputa from 872 tuberculosis suspects underwent microscopy and culture on solid and liquid media. Isolates were identified as *Mycobacterium tuberculosis* or species of non-tuberculous mycobacteria using Hain's GenoType® Mycobacterium CM/AS Molecular Genetic Assay. Drug susceptibility testing was done using the BACTEC MGIT 960 incubator. Hain's GenoType MTBDR*plus* Molecular Genetic Assay was also used to determine resistance to isoniazid and rifampicin. Blood samples from 695 out of the 872 tuberculosis suspects enrolled into the study were screened for human immunodeficiency virus infection using Uni-Gold™ rapid test and positives confirmed with enzyme linked immunosorbent assay. A questionnaire

was used to collect demographic and medical history data of the tuberculosis suspects. The Ziehl Neelsen smear positivity rate was 42.7% among the human immunodeficiency virus infected cases and 57.3% among the non-infected cases. Culture positivity rate among the human immunodeficiency virus infected cases was 46.4% and 53.6% among the non-infected cases. Tuberculosis prevalence was 39.7% with disease significantly in males than females ($P < 0.05$). Tuberculosis recurrence rate was 44.8% with no significant difference between the genders ($P > 0.05$). Human immunodeficiency virus prevalence was 39.1% with infection significantly higher among females than males ($P < 0.05$). Tuberculosis - human immunodeficiency virus co-infection rate was 41.8% with no significant difference in co-infection between the genders ($P > 0.05$). Non-tuberculous mycobacterial disease prevalence was 1.72%. A total of 8 out of 12 *Mycobacterium tuberculosis* mono-drug resistant isolates were from human immunodeficiency virus infected cases. Ziehl Neelsen smear microscopy was inaccurate in the diagnosis of tuberculosis among human immunodeficiency virus infected patients compared to culture. Tuberculosis and human immunodeficiency virus / acquired immunodeficiency syndrome prevalence were high in western Kenya. Tuberculosis recurrence rate was high in western Kenya. Tuberculosis - human immunodeficiency virus co-infection rate was high in western Kenya. Non-tuberculous mycobacteria played a significant role in causing tuberculosis-like disease which was misdiagnosed as tuberculosis. Anti-tuberculosis drug resistance was more among *Mycobacterium tuberculosis* isolates from human immunodeficiency virus infected patients suggesting a positive correlation. A more accurate diagnostic technique to augment Ziehl Neelsen smear microscopy is needed to improve tuberculosis diagnosis among human immunodeficiency virus infected patients. There is need to explore new approaches to childhood tuberculosis diagnosis in order to increase case detection rate. The high prevalence of

tuberculosis and human immunodeficiency virus infection in western Kenya underscores the need for more efforts and resources to increase knowledge and access healthcare. The high tuberculosis recurrence rate observed in this study calls for studies to determine the proportions of the disease attributable to endogenous re-activation and exogenous re-infection. There is need to strengthen tuberculosis and human immunodeficiency virus / acquired immunodeficiency syndrome collaborative activities to reduce morbidity and mortality among co-infected patients. A more accurate diagnostic technique, a robust scoring system and algorithms for non-tuberculous mycobacterial disease need to be developed in order to enhance the diagnosis of the disease in Kenya. Large case-control studies are imperative to identify risk factors and determine the contribution of non-tuberculous mycobacteria to tuberculosis-like disease among human immunodeficiency virus / acquired immunodeficiency syndrome patients. Since no multi-drug resistant tuberculosis was observed in this study, continued use and surveillance of resistance trends to first-line anti-tuberculosis drugs would be prudent.