

Pulmonary tuberculosis among underground miners exposed to silica dust in Zambia's copper mines, a cross-sectional study

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Abstract

Aims: To determine dust-related dose response risk for pulmonary tuberculosis (PTB) among underground miners exposed to silica dust in Zambia's copper mines.

Methods: A cross sectional study of in-service miners (n=360) was conducted at Occupational Health and Safety Institute (OHSI), Zambia. A systematic review of medical data over a 5-year period from assessments conducted by doctors at OHSI and statutory silica exposure data (n=16678) from the Mine Safety Department were analysed. Lifetime cumulative exposure metrics were calculated. Multivariate logistic regression analysis was used to determine the association between PTB and lifetime exposure to silica, while adjusting for various confounders.

Results: The median respirable silica dust level was 0.3mg/m³ (range 0.1-1.3). The overall prevalence of PTB was 9.7% (n=35). In adjusted logistic regression models, high cumulative silica dust category showed a statistically significant association with PTB (OR= 6.7 (95% CI 1.9-24.9)) and a significant trend of increasing disease prevalence with increasing cumulative silica dust categories was observed: (low CDE = 3 (2.5%); medium CDE = 11 (9.4%) and high CDE = 21(17.1%)) ($p_{\text{trend}} < 0.01$). This dose response relationship was seen in linear regression models, adjusting for age, sex and smoking: for each unit increase in silica levels for each year of exposure, there was almost a twofold increase in PTB risk (OR: 1.9; 95% CI: 1.3-2.8). Smoking showed a statistically significant association with PTB (OR= 4.3(95% CI 1.9-9.9)).

Conclusions: Our results demonstrate the association of increased risk for PTB with cumulative dust in a dose related manner among this sample of copper miners. There is need to intensify dust control measures and incorporate anti-smoking interventions into TB prevention and control programmes in the mines.

Keywords Pulmonary Tuberculosis, Silica dust, Underground copper miners, Cumulative exposure, Smoking