ABSTRACT

The association between silica exposure, silicosis and tuberculosis. A systematic review

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BACKGROUND: While the association between silica dust and pulmonary tuberculosis has been known for over a century, there has never been a systematic review of this association.

OBJECTIVES: We undertook a systematic review of the evidence for the association between pulmonary tuberculosis and (1) silicosis, and (2) silica exposure controlling for silicosis, and their respective dose-response gradients.

METHODS: We searched PUBMED and EMBASE, and selected studies according to a priori inclusion criteria. We extracted, summarised and pooled the results of published case-control and cohort studies of silica exposure and/or silicosis and incident active tuberculosis. Study quality was assessed on the Newcastle-Ottawa Scale. Where meta-analysis was possible estimates were pooled using inverse-variance weighted random-effects models. Otherwise narrative and graphic synthesis was undertaken. Confidence regarding overall evidence was assessed using the GRADE schema.

RESULTS: Nine studies met the inclusion criteria. Meta-analysis of eight studies of silicosis and tuberculosis yielded a pooled relative risk of 4.01 (95% confidence interval 2.88, 5.58). Dose-response gradients were strong with a low threshold for increased risk. Our GRADE assessment was high confidence in a strong association. Meta-analysis of five studies of silica exposure controlling for or excluding silicosis yielded a pooled relative risk of 1.92 (95% CI 1.36, 2.73). Our GRADE assessment was that of low confidence in the estimated effect owing to residual inconsistency and use of proxies for silica exposure. Dose-response gradients were observable but not fine enough to infer a threshold.

CONCLUSIONS: The evidence is robust for a strongly elevated risk of tuberculosis with radiological silicosis, with a low disease severity threshold. The effect is more uncertain for silica exposure without silicosis, and research is needed, particularly cohort studies measuring silica dust exposure in different settings, to determine the magnitude of effect and the threshold that would avoid an excess risk of tuberculosis.