Author's response to reviews

Title: Tuberculosis among health care workers in KwaZulu-Natal, South Africa: a retrospective cohort analysis

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Version: 4 Date: 30 July 2014

Author's response to reviews: see over
Reviewer's report
Title: Tuberculosis among health care workers in KwaZulu-Natal, South Africa: a retrospective cohort analysis
Version: 3
Date: 12 June 2014
Reviewer: Rodney Ehrlich

Reviewer's report:
General
The authors have responded to most of the comments made by the reviewers, and the manuscript has been strengthened. However, I have still some concerns.

Major compulsory revisions

1. Given that this is a retrospective cohort study, the definition of how the cohort was formed needs more detail under Study Setting and Sample. Are all staff at the hospital examined or otherwise “registered” by the occupational health services at these hospitals so that they have “occupational health medical records”? This needs to be stated explicitly.

   We appreciate the Reviewer’s suggestion and have added the following text to page 6 of the text.

   “Each of the three study hospitals had an occupational health clinic staffed by a nurse. New employees undergo a pre-placement health assessment prior to beginning work in the facility and have an occupational health medical record created. Occupational health clinics provide preventive and treatment services for occupational illnesses and injuries such as HIV post-exposure prophylaxis for needle stick injuries as well as general wellness services (family planning, immunization, etc), and HIV counseling and testing.”

2. Given the space devoted to Tables 2 and 3 (drug resistance and treatment outcomes), this descriptive component of the study needs to be included as an objective in the Introduction, since it is quite different from the other objectives.

   (However, I continue to believe that inclusion of this information is a distraction from the important findings of this study given its original objectives. A separate paper or scientific letter covering this component would be preferable.)

   We appreciate the Reviewer’s perspective. However, we prefer to maintain Table 2 because it provides detail that may be of interest to readers and that may be useful to health officials in assessing the need for infection control. Per the Reviewer’s suggestion we have added this descriptive component to the introduction on page 5.

   The main objective of this study was to compare the difference in TB incidence between HCWs with versus without a history of working in a TB ward. We also sought to describe TB disease and treatment outcomes and estimate the incidence of TB among a sample of HCWs in KwaZulu-Natal, and to identify risk factors for TB disease in HCWs.

   Per the Reviewer’s suggestion we have deleted Table 3 and discussed this in the text on page 10.
Thirty-two percent (n=36) of HCWs with TB were cured, 29% (n=33) completed treatment, and two (2%) defaulted treatment. Twelve percent (n=13) of HCWs with TB died: among them four (31%) died with MDR-TB, five (38%) with drug-susceptible TB, and four (31%) did not have TB drug susceptibility recorded in the chart. Twenty-five (22%) HCWs did not have a final treatment outcome recorded in their occupational health medical record; 11 (16%) with drug-susceptible TB, 3 (21%) with MDR-TB and 11 (39) without drug-susceptibility recorded in the chart.

3. The authors do not seem to have dealt with their findings with regard to occupation, viz. that there is no significantly elevated risk among clinical staff relative to administrative staff. Given the finding that working in Stores seems to confer the greatest relative risk, it suggests even further a pervasive risk of “facility related” transmission not limited to ward care. (Is there, for example, on site hostel accommodation for staff? What about eating or hospital provided transport facilities?). Also, the authors devote quite a bit of attention to the source of elevated risk in paediatric wards. Some thought should be given to possible explanations for the elevated risk in Stores, as well as what infection control would entail in such an area.

We thank the Reviewer for this comment. We have added the following text to page 12 to address this concern.

“In this sample, the area with the greatest incidence of TB was working in the stores/workshop. While employees working in these areas move throughout the hospital, they spend less time in clinical areas than other HCWs. The risk in this group may indicate that infection control measures in these areas are inadequate due to a low perceived risk and poor to non-existent infection control measures due to the necessity to keep hospital supplies in a climate controlled environment. Transmission in this area may be occurring between staff working in these areas that may be exposed to TB in the community. Community exposure was not measured in this study. These findings indicate a need to further investigate infection control in non-clinical areas and to include non-clinical staff in infection control education. In addition, occupational health should include these non-clinical staff in TB symptom screenings to potentially identify cases amongst this group.”

Minor essential revisions.

1. Although implicit, it is worth making explicit that community risk contributes to a substantial fraction of cases in hospital staff – around 50% on average, given the IRR of 2 on average. This means that even if on site transmission were well controlled, a substantial number of cases of TB would still occur among staff.

We agree with the Reviewer that community-level risk for TB is quite high. However, we focus on the additional risk associated with working at these hospitals and identifying risk factors for high TB incidence among HCWs. We added the following paragraph to page 13 of the discussion.

Our comparison of TB incidence rates in this sample with the general population indicated that HCWs had a greater incidence of TB than the general population of the province and the districts where the hospitals are located. This further
supports previous findings that HCWs, despite high levels of TB in the community, have greater risk of developing TB than the general population [35]. This suggests that current infection control measures and occupational health services are not completely effective at protecting HCWs in the workplace.

2. Although routine TB symptom screening of staff for symptoms may be “simple” at an individual level, it is not simple at a scaled-up programme level. (As evidenced by the fact that only 19% of HCWs at these hospitals were screened in 2010). Some acknowledgement of the difficulties of screening of all staff in large facilities or clinic systems needs to be acknowledged.

We thank the Reviewer for his suggestion. We have added the following to page 14 of the text.

“While routine screening of HCWs for TB symptoms is relatively simple; the implementation of this can be challenging especially as screening of HCWs for TB is not mandatory and no official guidelines regarding screening HCWs for TB currently exist. For example, we found as part of a separate aim of this study that in 2010 only 19% of all HCWs across the hospitals were screened.”

3. The Abstract needs to be adjusted to reflect the above points as appropriate.

Per the Reviewer’s request the abstract has been changed accordingly.

**Background:** Tuberculosis (TB) is an occupational hazard for health care workers (HCWs) who are at greater risk of developing TB than the general population. The objective of this study was to compare the difference in TB incidence among HCWs with versus without a history of working in TB wards, to estimate and describe the incidence of TB among HCWs, and to identify risk factors for TB disease in HCWs.

**Methods:** A retrospective cohort study (January 2006 to December 2010) was conducted in three district hospitals in KwaZulu-Natal, South Africa. Data were abstracted via chart review from occupational health medical records. Bivariate and multivariate analyses were performed using a Poisson multilevel mixed model.

**Results:** Of 1,313 (92%) medical charts reviewed with data on location of work documented, 112 (9%) cases of TB were identified. Among HCWs with TB 14 (13%) had multidrug-resistant TB. Thirty-six (32%) were cured, 33 (29%) completed treatment, and 13 (12%) died. An increased incidence of TB was reported for HCWs with a history of working in TB wards (incidence rate ratio [IRR] 2.03, 95% CI 1.11-3.71), pediatric wards (IRR 1.82 95% CI 1.07-3.10), outpatient departments (IRR 2.08 95% CI 1.23-3.52), and stores/workshop (IRR 2.38 95% CI 1.06-5.34) compared with those without such a history. HCWs living with HIV had a greater incidence of TB (IRR 3.2, 95% CI 1.54-6.66) than HIV-negative HCWs. TB incidence among HCWs was approximately two-fold greater than that of the general population over the study period.

**Conclusions:** HCWs working in a TB ward had an increased incidence of TB. However, a greater incidence of TB was also found in HCWs working in other wards including pediatric wards, outpatient departments and stores. We also identified a greater incidence of TB among HCWs than the general population. These findings further support the need for improved infection control measures throughout hospitals not only in TB or drug-resistant TB wards or areas.
perceived to be at high-risk to protect HCWs. Additionally, it is recommended for occupational health services to routinely screen HCWs for TB, provide HCWs with access to care for TB and HIV.