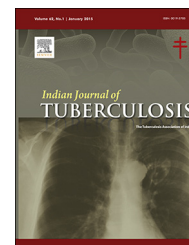


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Original Article

Airborne infection control in India: Baseline assessment of health facilities

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ABSTRACT

Background: Tuberculosis transmission in health care settings represents a major public health problem. In 2010, national airborne infection control (AIC) guidelines were adopted in India. These guidelines included specific policies for TB prevention and control in health care settings. However, the feasibility and effectiveness of these guidelines have not been assessed in routine practice. This study aimed to conduct baseline assessments of AIC policies and practices within a convenience sample of 35 health care settings across 3 states in India and to assess the level of implementation at each facility after one year.

Method: A multi-agency, multidisciplinary panel of experts performed site visits using a standardized risk assessment tool to document current practices and review resource capacity. At the conclusion of each assessment, facility-specific recommendations were provided to improve AIC performance to align with national guidelines.

Result: Upon initial assessment, AIC systems were found to be poorly developed and implemented. Administrative controls were not commonly practiced and many departments needed renovation to achieve minimum environmental standards. One year after the baseline assessments, there were substantial improvements in both policy and practice.

Conclusion: A package of capacity building and systems development that followed national guidelines substantially improved implementation of AIC policies and practice.

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1. Background

The risk of nosocomial transmission of airborne infections like *Mycobacterium tuberculosis* from individuals with disease to health care workers (HCWs) and other patients has been recognized for many years.¹⁻¹³ A systematic review of 51 studies conducted in low- to middle-income countries found that TB incidence among HCWs was high, ranging from 69 to 5780 per 100,000.¹ Evidence shows that TB is a significant occupational problem among HCWs,¹⁻¹³ especially in hospitals with no TB control measures in place.² Nosocomial outbreaks of airborne infections like influenza H1N1, H5N1, drug-susceptible, multidrug-resistant TB (MDR TB), and extensively drug-resistant TB (XDR TB), especially among HCWs with HIV infection, and reported high rates of morbidity and mortality have been linked to the absence or limited application of airborne infection-control strategies.^{6,7,14} Since then, there has been renewed interest in understanding the impact of infection control measures in medical facilities.

India is the highest TB burden country accounting for one-fourth of the global incidence with 2.2 million incident TB cases emerging annually.¹⁵ In 2012, India's Revised National TB Control Program (RNTCP) managed 1.46 million TB cases,¹⁶ and unknown thousands more were managed in the private sector.¹⁷⁻²⁰ Prevailing infection control practices in India revolve around biomedical waste management and disposal of sharps; while airborne infection control (AIC) measures are largely absent from the health care facilities' policies and practices.²¹ Nosocomial TB has in large part not been addressed by researchers in India, but those few studies that have been published have uniformly reported much higher TB disease rates among HCW than estimated to occur in the general population.^{9,12,13}

To address the need for a simple, effective, and affordable AIC program in health care facilities in India, National Guidelines on Airborne Infection Control in Health Care and other settings in India – 2010 (NAIC) were published as the first, formal national guidelines on reducing the risk of airborne infections in health care facilities and special high-risk settings in India (e.g. respiratory disease wards, MDR-TB wards, Antiretroviral treatment centers, and TB culture and drug susceptibility testing laboratories).²¹

Till date, there has not been any large-scale, representative assessment of AIC practices over a broad spectrum and at multiple levels of health care in India. Therefore, as part of the national effort to assess the baseline implementation of the NAIC guidelines, we conducted systematic facility assessments to assess the risk of airborne transmission in 35 selected health care facilities, ranging from tertiary level medical colleges to primary health centers from the 3 states of West Bengal, Gujarat, and Andhra Pradesh. Each site received a tailored set of recommendations of administrative, environmental, and personal protective measures, in line with national guidelines.

We also sought to reassess the implementation of NAIC recommended administrative and managerial control measures by the administrators at state, district, and health care facilities, one year after baseline recommendations.

2. Objectives

- To conduct systematic baseline assessments of AIC administrative, environmental, and personal protective policies and practices within HCF in India and
- To assess the level of NAIC guidelines implementation after one year.

3. Methods

During October 2009–September 2011, 35 HCFs across 13 districts in 3 states of India – West Bengal, Gujarat, and Andhra Pradesh – were selected for facility-based assessments for the risk of airborne disease transmission. The states, districts, and facilities were a nonrepresentative convenience sample, but were purposefully selected to provide experiences with AIC practices at all levels of the health system. Of the 35 facilities, 11 were from West Bengal (across 3 districts), 11 were from Gujarat (across 7 districts), and 13 were from Andhra Pradesh (across 3 districts). At the conclusion of each assessment, a series of written recommendations were provided to HCF administrators to improve policies and practice, based on the NAIC guidelines. After one year, each facility was reassessed to compare NAIC implementation as compared to baseline assessment results.

A multi-agency, multidisciplinary panel of experts conducted standardized risk assessments, including field-based observational visits to document infection control practices, human resource capacity, and administrative and environmental controls. The expert panel included members from the respective state AIC committees with support from the Central TB Division – India (CTD), World Health Organization (WHO), and the Program for Appropriate Technology in Health (PATH). The principal investigator and most of the coauthors were members of these baseline assessments. A standardized risk assessment methodology utilized a structured reporting format covering a range of AIC interventions [i.e., equipment/material to conduct baseline assessment like incense sticks to assess direction of air flow, measuring tape to measure volume of rooms, Vaneometer™ (i.e., swing-vane anemometer) (Dwyer Instruments, Michigan City, IN, USA) and DCFM700 Digital Anemometer (General Tools, New York, NY USA) to measure air velocity from openings, AirMeter 460 (Dwyer Instruments, Michigan City, IN, USA) to measure air velocity from ducts, and digital and mobile phone cameras to take pictures for documentation]; quarterly reports on AIC to monitor implementation of AIC guidelines; structured checklist to monitor coordination mechanisms for tracking administrative activities of the state and district level coordination mechanism; and a predetermined set of monitoring indicators covering administrative and managerial control measures at state, district, and facility levels for data compilation and analysis.

4. Variables and data collection

A predetermined set of indicators of AIC policies and practices were used for describing key administrative, environmental, and personal protective measures (Table 1).

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