

Assessment of Health Facilities for Airborne Infection Control Practices and Adherence to National Airborne Infection Control Guidelines: A Study from Kerala, Southern India

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Abstract

Introduction: Nosocomial transmission of airborne infections, such as H1N1, drug-resistant tuberculosis, and Nipah virus disease, has been reported recently and has been linked to the limited airborne infection control strategies. The objective of the current study was to assess the health facilities for airborne infection control (AIC) practices and adherence to the National AIC (NAIC) guidelines, 2010. **Materials and Methods:** A cross-sectional study was conducted in 25 public and 25 private hospitals selected from five randomly selected districts in the state of Kerala. A checklist with 62 components was developed based on the NAIC guidelines. Frequencies, percentages, and mean with standard deviation were used to summarize facility risk assessment and compliance to guidelines. **Results:** Most of the facilities had infection control committees 35 (70%). Annual infection control trainings were held for staff in 21 (42%) facilities. Twenty (40%) facilities were not familiar with NAIC guidelines. Counseling on cough etiquette at registration was practiced in 5 (10%) institutions. Cross ventilation was present in outpatient departments in 27 (54%) institutions. Sputum was disposed properly in 43 (86%) institutions. N95 masks were available in high-risk settings in 7 (14%) health facilities. **Conclusion:** There exist deficiencies in adherence to all components of NAIC guidelines including administrative, environmental, and use of personal protective equipment in both government and private hospitals in the state.

Keywords: Airborne infection control, nosocomial infections, tuberculosis

INTRODUCTION

Airborne transmission of infectious disease is a major public health concern.^[1] Evidence shows that tuberculosis (TB) is a significant occupational problem among health-care workers (HCWs), especially in hospitals with no TB control measures in place. Nosocomial outbreaks of airborne infections such as influenza H1N1, H5N1, drug-susceptible, multidrug-resistant TB, and extensively drug-resistant TB have been reported, and high rates of morbidity and mortality have been linked to the absence or limited application of airborne infection control strategies.^[2-4] The airborne infection control (AIC) precautions and practice in health-care institutions are important to prevent the cross-contamination and transmission of infectious diseases not only to the health-care personnel but also to the general population.^[5] The airborne transmission becomes even more prevalent in health-care settings because of overburdened

and overcrowded hospitals and the presence of patients with immunosuppression.^[6-8]

National AIC (NAIC) guidelines were formulated in India in 2010. These guidelines included specific policies for TB prevention and control in health-care settings. However, the compliance with these guidelines have not been assessed in routine practice in Kerala. The objective of the current study was to assess the health facilities for AIC practices and adherence to the NAIC guidelines, 2010.

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MATERIALS AND METHODS

A cross-sectional study was conducted. Fifty health-care facilities - 25 each from Government and Private were selected from five randomly selected districts in the state of Kerala. Two community health centers, two Taluk headquarter hospital, and one district hospital were selected from the public sector in each district while two private hospitals with 10–50 beds, two hospitals with 50–100 beds, and one hospital with above 100 beds were selected from each district.

A checklist was developed based on the NAIC guidelines, which dealt with three main domains of infection control-administrative control, environmental control, and personal respiratory protection measures. Checklist had 62 essential components. Content validation of the checklist was done by two experts in the field. It was pilot tested before use. Major components in checklist were administrative control measures include education and training of staff; out-patient department (OPD) measures such as screening of patients for respiratory complaints, education for cough etiquette, segregation of respiratory symptomatic in a ventilated waiting area, fast-tracking of respiratory symptomatic; inpatient department measures including educating patients and attendants about cough hygiene, routine segregation of patients to separate infectious wards or separate areas in same ward, maintain spacing between beds, safe sputum collection practices; environmental control measures including ensuring effective ventilation.

Principal investigator visited all the institutions after obtaining necessary permissions interview was conducted with medical and nursing superintendents. Relevant data and information were collected and recorded by observing general OPD, pulmonology OPD, in patient general wards, medical intensive care units, causality, and laboratory of each facility.

Statistical analysis was performed using the IBM Statistical Package for Social Sciences version 20 (IBM). Frequencies, percentages, and mean with standard deviation were used to summarize facility assessment and compliance. The study had been approved by the ethical review committees of the Institutional Review Board.

RESULTS

Most of the facilities had infection control committees 35 (70%). Annual infection control trainings were held for staff in 21 (42%) facilities, but 20 (40%) of facilities were not familiar with NAIC guidelines.

Counseling on cough etiquette/hygiene practices in registration/waiting areas was practiced in 5 (10%) institutions. Cross ventilation was present in OPDs in 27 (54%) institutions. Fast-tracking of respiratory symptomatic in OPD was practiced in 9 (18%) institutions. Segregation of respiratory symptomatic was practiced in 10 (20%) of the facilities. The provision of providing masks to respiratory symptomatic was present in 12 (24%) of institutions. Sputum was disposed of properly in

43 (86%) institutions. N95 masks were available in high-risk settings in 7 (14%) health facilities. Details of administrative measures for AIC practices, AIC measures in OPDs, and practice of personal protective equipment are summarized in Tables 1-3, respectively.

Out of the 62 components, the mean score for public health-care setting was 22.32 ± 8.138 (median 21) and private health-care setting was 29.88 ± 13.667 (median 31), respectively. In the public health-care setting, the mean values of the administrative, personal protective, and environmental components were 13.24 ± 5.718 , 6.80 ± 2.754 , and 2.28 ± 1.514 , respectively. (Maximum scores possible were 33.17 and 12, respectively). Private health-care sector had a mean value of 16.24 ± 8.733 for the administrative, 9.88 ± 4.275 for the personal protective and 3.76 ± 2.223 for environmental components. Mean (standard deviation) scores for community health centers, Taluk headquarter hospitals, and District/General Hospital was 15.80 (4.86), 19.20 (6.87), and 25.00 (4.18).

DISCUSSION

Airborne infectious diseases remain a very important occupational risk for HCWs and the risk is increased with inadequate infection control strategies.^[1,9] The current study demonstrates the measures to control airborne infectious disease among 50 health-care institutions in five districts in Kerala. The AIC measures in health-care institutions assessed in Kerala depict lacunae. It is felt that AIC systems were underdeveloped, the airborne component was generally not included in existing infection control systems.

Although there is ample scope for improvement in AIC measures in health facilities in Kerala, the situation seems better when compared to similar studies done elsewhere in the country. Baseline study to assess facility risks for airborne infection was done in health facilities of three northern Indian states. The study found that administrative measures specific to AIC were negligible. Routine N95 respirators use was observed in only 2 of the 21 high-risk settings.^[10]

Most environments could be effectively ventilated with natural ventilation, but nonusage of available ventilation (i.e., shut windows) or layered modifications, such as deliberate blocking of windows, had reduced the potential ventilation.^[11,12] Natural ventilation is particularly suited to limited-resource settings and tropical climates, where the burden of TB and institutional TB transmission is the highest. Use of personal protective measures by HCWs was found to be negligible even in high-risk settings.^[13,14] This challenge might be overcome through proper training, education, and monitoring mechanisms. Integrating AIC principles into existing general infection control training and education modules was recommended.

Hospital reports and records were trusted for data as direct verification or counterchecking were not feasible. Statistical analysis of predictors of good practices was not attempted

Table 1: Details of administrative airborne infection control practices (n=25)

Indicator	Public, n (%)	Private, n (%)	Total, n (%)
Facilities with IC committees in place	20 (80)	15 (60)	35 (70)
IC committee meetings held in the last 3 months	16 (64)	16 (64)	32 (64)
Health facility IC plan available in written form	9 (36)	12 (48)	21 (42)
Facility risk assessment for airborne infections conducted	0	9 (36)	9 (18)
Routine surveillance for nosocomial infections performed	7 (28)	14 (56)	21 (42)
Periodic IC training for the hospital staffs	18 (72)	17 (68)	35 (70)
Periodic assessment on infection prevention practices	11 (44)	12 (48)	23 (46)
Hospital familiar with the Ministry of Health and Family Welfare AIC guidelines	8 (32)	12 (48)	20 (40)
Policy for screening and restricting family/visitors with illnesses	11 (44)	12 (48)	23 (46)
Reassessment of infection prevention policies and procedures (annual)	16 (64)	17 (68)	33 (66)

IC: Infection control, AIC: Airborne IC

Table 2: Airborne infection control practices at outpatient departments (n=25)

Indicator	Public, n (%)	Private, n (%)	Total, n (%)
Counseling on cough etiquette/hygiene practices in registration/waiting areas	3 (12.0)	2 (8.0)	5 (10.0)
IEC material on cough hygiene displayed/handed over to patients	10 (40.0)	9 (36.0)	19 (38.0)
Provided masks to respiratory symptomatic at the reception area	6 (24.0)	6 (24.0)	12 (24.0)
Separated well ventilated waiting area for respiratory symptomatic	13 (52.0)	1 (4.0)	14 (28.0)
Fast tracking of respiratory symptomatic	5 (20.0)	4 (16.0)	9 (18.0)
Segregation of respiratory symptomatic	4 (16.0)	6 (24.0)	10 (20.0)
Adequate cross ventilation available	18 (72.0)	9 (40.0)	27 (54.0)

IEC: Information education and communication

Table 3: Details of practice of using personal protective equipment (n=25)

Indicator Practices and behaviors	Public, n (%)	Private, n (%)	Total, n (%)
Practice of hand hygiene among health workers	24 (96.0)	19 (76.0)	43 (86.0)
Availability of PPE's and use among health workers	19 (76.0)	21 (84.0)	40 (80.0)
Provided N95 respirators at high risk settings	0 (0.0)	7 (28.0)	7 (14.0)
Usage of N95 respirators at high risk settings	0 (0.0)	5 (20.0)	5 (10.0)
Sputum disposal as per the BMW management plan	20 (80.0)	23 (92.0)	43 (86.0)
Proper disposal facilities for used surgical masks	24 (96.0)	25 (100.0)	49 (98.0)
Preemployment medical examination among staffs for respiratory conditions	0 (0.0)	5 (20.0)	5 (10.0)

PPE's: Personal protective equipment, BMW: Biomedical Waste Management

because of the small sample size and wide heterogeneity of sample due to stratification. Facilitators and barriers for ensuring adherence to the NAIC guidelines need to be explored qualitatively. The study also did not assess the impact of the interventions on reduction of nosocomial transmission, neither by surveillance among HCWs as this was beyond the scope of the study objectives.

Dissemination of NAIC guidelines has to be given due importance in Kerala state which is very essential for preventing nosocomial airborne transmission of infections. Making hospitals compliant to AIC need to address deficiencies in all components of NAIC guidelines including administrative, environmental, and use of personal protective equipment in both government and private hospitals in the state. Establishment of functional hospital infection control committees, periodic infection control training for the hospital staffs, and routine assessment on airborne infection prevention

practices need to be done in all health-care facilities. All health facilities need to undertake facility risk assessment and based on that, locally customized low-cost interventions need to be adapted to ensure compliance to AIC.^[15] Simple administrative interventions for providing counseling on cough etiquette/hygiene practices in registration/waiting areas, displaying information, education, and communication material on cough hygiene, providing masks to respiratory symptomatic at the reception area, fast-tracking or respiratory symptomatics and segregation of respiratory symptomatic need to be ensured in all hospitals. Provision for and usage of N95 respirators need to be ensured at high-risk settings.^[3,16] AIC need to find a place in quality improvement process in health care such as accreditation of hospitals. The findings also suggest the need to establish routine surveillance for nosocomial infections and capture data regarding the incidence of airborne infections among HCWs.^[2,17]

CONCLUSION

There exist deficiencies in adherence to all components of NAIC guidelines including administrative, environmental, and use of personal protective equipment in both government and private hospitals in the state. The systematic scale-up of AIC measures across all health-care facilities in the state can serve as preparedness plan for preventing airborne infections of pandemic potentials. This can also accelerate TB elimination in the state.

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Conflicts of interest

There are no conflicts of interest.

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