Regional Workshop on Infection Control to Prevent TB Transmission in Health Facilities

A Report
Kathmandu Nepal, 14-18 September 2009

World Health Organization
Regional Office for South-East Asia

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"It may seem a strange principle to enunciate as the very first requirement of a hospital is that it should do the sick no harm."

Florence Nightingale, 1863

Printed in India

Contents

Abbreviations and Acronyms

ACH	air changes per hour
ACSM	advocacy, communication and social mobilization
AIDS	acquired immunodeficiency syndrome
CE	indicates conformity with the essential health and safety requirements set out in European directives
CDC	Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America
DNA	deoxyribonucleic acid
DOT	directly observed therapy
GRADE	grading of recommendations assessment, development and evaluation
HCF	health care facilities
HCW	health care workers
HEPA	high-efficiency particulate air
HIC	high-income countries
HIV	human immunodeficiency virus
HRD	human resource development
IC	infection control
IEC	information, education and communication
IPC	infection prevention and control
IPT	isoniazid preventive therapy
LIC	low-income countries
LMIC	low and middle-income countries
LTBI	latent tuberculosis infection
MDR-TB	multidrug-resistant TB
MIC	middle-income countries
NIOSH	national Institute for occupational safety and health, CDC, USA
NTP	national TB programme
TB	tuberculosis
TST	tuberculin skin test
UNAIDS	The United Nations Joint Programme on HIV/AIDS
UVGI	ultraviolet germicidal irradiation
XDR-TB	extensively drug-resistant TB
WHO	World Health Organization

1. Background

TB infection control is a combination of measures aimed at minimizing the risk of TB transmission. The foundation of infection control is early and rapid diagnosis, and proper management of TB patients.

TB infection control requires and complements implementation of core activities in TB control, HIV control and health-systems strengthening. It should be part of national infection prevention and control policies because it complements such policies – in particular, those that target airborne infections. (WHO 2009 guidelines)

The increasing importance of drug-resistant TB (MDR-TB/XDR-TB), as well as the impact of HIV infection, has led to a reappraisal of the importance of infection control in health care and congregate settings. Presence of HIV-infected and immuno-compromised patients in health care and congregate settings and the absence of an appropriate infection control policy and practice create a favorable environment for transmission of TB among hospital patients, hospital workers and the community. Therefore, there is an urgent need to refocus attention on TB infection control, particularly in high- risk settings.

1.1 Opening of the session

After the introduction of the workshop participants, Dr Pushpa Malla, National TB programme manager, Nepal, was elected as chairperson. The background to the workshop, objectives and expected outcomes were presented by Dr Md Khurshid Alam Hyder, Medical Officer TB, WHO Regional Office for South-East Asia. Dr Balasangameshwara H. Vollepore and Dr Rajeswari Ramachandran from India were nominated as rapporteurs.

1.2 Objectives

The objectives of the workshop were to:

(1) Review current technical guidelines and share experiences on best practices to prevent nosocomial transmission of TB;

(2) Identify appropriate interventions for infection control at different levels of health facilities;

(3) Plan for the integration of components of infection control within national TB control plans; and

(4) Identify the technical and financial support needed and mechanisms to secure the required support for the infection control components of national TB plans.

The expected outcomes from the workshop were that:

- The participants would gain technical and programmatic knowledge about TB infection control; understand the importance of implementing appropriate infection control interventions in health care settings; acquire the necessary skills to conduct a situational analysis and assessments of TB infection control measures in different health facilities; and learn the process of developing and implementing national infection control action plans in the respective countries.

2. Introduction to infection control (IC) and policies in IC

Review of factors affecting TB transmission

TB transmission is generally unpredictable. Mostly infection is from smear positive, untreated or poorly treated patients, but not all smear positive untreated patients produce large aerosols of droplet nuclei. An infectious TB patient can release many tiny particles called droplet nuclei into the air by coughing or sneezing. These droplet nuclei, invisible to the naked eye and are approximately 1 to 5 microns in size, will remain airborne and are potentially infectious till removed through dilution or filtration or inactivated

by radiation in the environment. Droplet nuclei can remain airborne in room air for a long period of time, until they are removed by natural or mechanical ventilation. In order for TB to spread, there must be a source patient who has infectious TB disease and a susceptible host (a person who inhales droplet nuclei containing *M. tuberculosis*). Anyone who shares air with a person with infectious TB disease of the lungs or larynx is at risk, although TB is not usually spread by brief contact. TB is spread when another person inhales one or more of these particles and then becomes infected with TB.

Substantial transmission of TB occurs in health care facilities (HCF), as measured by occupational risk at HCF. This poses an occupational hazard to patients and to health care providers alike. TB transmission in the health care settings counteracts the benefits of TB control programme. Studies done in HCF of Thailand have shown the highest risk of TB infection during the first 12 months of employment. Poor acceptance and compliance with isoniazid preventive therapy by health staff compounded the problem.

M. tuberculosis infections are also a proven hazard to laboratory personnel as well as others who may be exposed to infectious aerosols in the laboratory, autopsy rooms, and other healthcare facilities. Even a low infective dose of *M. tuberculosis* (i.e., ID50 <10 bacilli) from sputa and other clinical specimens from suspected or known cases of tuberculosis must be considered potentially infectious and hence require care during collection and transportation of specimens. Exposure to laboratory-generated aerosols are well known and the hazard encountered by laboratory personnel are due to tubercle bacilli that may survive and get aerosolized during procedures such as smear preparation, concentration procedures after decontamination, manipulation of both (solid media and liquid media), preparation of frozen sections etc. Accidental needle-stick injuries are also a recognized hazard.

Generally, smear-positive patients are much more infectious than smear- negative cases and 30% of household contacts of smear-positive patients are infected. Surprisingly, most patients are non-infectious and a few "very-infectious" individuals appear to be responsible for most of the transmission.

Substantial transmission of TB occurs in health care facilities, as measured by occupational risk among healthcare workers. The hazard to

patients and providers seems similar. Most infections are from large aerosols produced by smear-positive, untreated/poorly treated patients.

There is an increased risk of latent TB infection (LTBI) significantly associated with occupational exposure among healthcare workers (HCW). The factors related to the index TB case that affect transmission are as follows: Site of disease, extent of disease, smear status, culture status, effective anti-TB treatment and some of the physical properties of lung lining fluid. The most commonly associated factors with LTBI are employment > 1 year, frequent and direct patient contact and male sex. A systematic review of TB among HCWs in low and middle-income countries showed the prevalence of LTBI to be 54% (33% – 79%) and the annual risk of LTBI around 0.5% – 14.3 %. TB disease as an occupational hazard was observed as an increased risk (incidence rate ratio or IRR) in nurses (1.2 -28), lab technicians (6-25), radiology technicians (6-53) and doctors (0.5-11).The excess occupational risk IRR as determined by the work location was for outpatient facilities (4.2-11.6), for general medical wards (3.9-36.6), for inpatient facilities (14.6-99.0), for emergency rooms (26.6-31.9) and for laboratories (78.9).

The risk factors contributing to health-care associated transmission are delayed diagnosis, delayed initiation of treatment, inadequate airborne precautions and lack of adequate respiratory protection.

Some of the TB control measures suggested for health facilities are listed below:

Administrative controls

- Administrative controls are at the first level in the measures to be put in place, that help to reduce the risk of exposure to persons with infectious TB. Administrative control includes separation of patients with respiratory symptoms, early identification of patients, training on cough etiquette and education.
- Development of an Infection control plan and SOPs
- Healthcare workers' (HCW) education and training (including laboratory staff)
- Screening of HCWs and isoniazid preventive therapy.

Environmental controls

- Natural ventilation maximized in high-risk areas
- Negative pressure ventilation in TB isolation rooms
- Class II bio-safety cabinets for laboratories undertaking TB cultures.

Personal protection includes wearing of N95 or FFP2 masks as required in high-risk settings, especially in inpatient facilities with drug-resistant tuberculosis cases, and during high-risk aerosol-generating procedures such as bronchoscopy or sputum induction.

3. WHO TB infection control policy guidelines

An overview of the WHO TB infection control policy guidelines was presented and discussed. The policy defines the administrative, environmental and personal protective measures to be taken as well as elements of the airborne infection control plan. The aim of the policy is to provide countries with guidance on how to reduce the risk of TB transmission in health care facilities, households and congregate settings and how to prioritize TB infection control measures.

The component activities described under six headings, are to:

(1) **Identify and strengthen coordinating bodies, and develop a comprehensive human resource development plan for planning and implementation at all levels.** This includes adaptation of national policy incorporating a legal framework, comprehensive planning and budgeting, and development of an HR plan for capacity building.

(2) **Ensure that health facility design, construction, renovation and use are appropriate.** The objective of this concept is to minimize the risk of exposure in new constructions and renovations and sensitize architects, engineers, public works departments, and policy makers to elements of design and construction that need to be in place.

(3) **Conduct surveillance for nosocomial transmission and assessment of infection control measures in place at all levels of health facilities and in congregate settings.** The objectives are to assess health facilities, monitor the implementation of infection control activities, and conduct surveillance for TB disease among healthcare workers to inform implementation.

(4) **Promote advocacy, communication and social mobilization** to create demand for infection control measures, including by communities.

(5) **Monitor and evaluate TB infection.**

(6) **Enable and conduct research.**

3.1 Hierarchy of infection controls

(1) Administrative controls to reduce risk of exposure, infection, and disease through *policy and practice.*

(2) Engineering controls to reduce concentration of infectious bacilli in areas where contamination of air is likely.

(3) Personal respiratory protection to protect personnel who work in environments with contaminated air.

The policy accords the highest priority to national managerial activities and facility-level managerial activities and identifies administrative precautions (separation of patients, early identification, cough etiquette and education) as the first and most important line of defense against TB transmission.

3.2 Administrative controls

All *policies* and *practices* developed by the infection control team to decrease the risk of exposure, infection and disease are called administrative controls. This includes procedures for implementing, enforcing, monitoring, evaluating, and revising the infection *control plans.* The foremost procedure under administrative controls is "Triage" where people with respiratory symptoms (TB suspects) are identified and separated in a well-ventilated waiting area and fast-tracked for diagnosis. The specific criteria for

separating patients will depend on the local settings and patient population. The guiding priorities are to minimize opportunities for transmission, to protect immuno-compromised patients and to keep drug-resistant TB from spreading. The policies for isolation and spacing recommended for inpatients will differ from outpatient practices and this may be based on smear and culture status, HIV status, suspicion/ confirmation of MDR and availability of airborne isolation areas, individual rooms, and well-spaced wards**.** This segregation requires both policy and enforcement for designating appropriate areas, routine HIV testing and automatic procedures to move patients when indicated. The second principle in administrative control is to educate patients on cough etiquette and respiratory hygiene. Healthcare workers should educate coughing patients orally or use patient education materials (posters, etc) displayed in the health facility.

At the same time, education and training of staff is key to infection control. Staff need to be well informed on issues about MDR–TB risk and prevention, as well as principles and practices of infection control. The responsibilities of health personnel and the institution should be clarified.

Other principles are to minimize the exposure of infectious patients such as those with smear-positive and MDR–TB to staff in health care facilities by following procedures like screening and marking out-patient tickets for fast-tracking TB suspects through clinics for diagnosis. Yet another principle is to keep cough producing/aerosol generating procedures such as sputum collection and sputum induction (bronchoscopy, suctioning, and sputum induction and nebulizer treatment) away from other patients and provide space to conduct these procedures in separate, well-ventilated rooms.

Periodic screening of healthcare workers for TB should be in place in all health facilities. For HIV-infected health care workers ART and isoniazid preventive therapy (IPT) should be provided. For the other workers the policy recommendation is to provide a package of prevention and care including HIV prevention and testing. These recommendations should be universal in high-HIV settings and conditional in low-HIV settings.

3.3 Environmental (engineering) infection controls

Environmental controls relate to architectural and engineering controls.

(1) **Building/architectural controls** depend on the position/ direction of the building, size of openings, flow of traffic, design and flow of natural ventilation.

(2) **Engineering controls** are discussed under mechanical ventilation, and include air-conditioning and filtering and the use of specialized fittings such as UV-lights.

Environmental control issues — improvement to buildings

The following aspects of buildings are to be considered: design, operation, maintenance and sustainability. In addition, it is necessary to look into building location and orientation, dimensions, window types and operation, other openings, doors, chimneys, construction methods and detailing external elements (walls, screens, etc.) and urban planning conditions.

Determinants of natural ventilation

The determinants that affect natural ventilation are cross ventilation, the "stack effect", size of windows, design of windows, wind speed, exposure to prevailing wind, elevation from ground, location of rooms and the location of the building.

Natural ventilation and calculating air changes per hour (ACH)

Most improvements in ventilation are based on natural ventilation. This is measured in terms of air changes per hour (ACH). One ACH is equivalent to moving the total amount of air out of a room and replacing it by fresh air. The recommended ACH for a room is 12 – 18 changes/hour.

Calculating air changes per hour (ACH)

ACH = Average air flow rate/ room volume

Example

Window opening = 0.5 m high, 0.5 m wide

Window area = 0.5 m x 0.5 m = **0.25 m^2**

Average air velocity through window = **1 m/s**

Average flow rate = Area of the window x average air velocity =

0.25 m^2 x 1 m/s x 3,600 s/h = **900 m^3/h**

Room dimensions = 3 m wide, 5 m deep, and 3 m high

Room volume = 3 m x 5 m x 3 m = **45 m^3**

ACH = Average flow rate/ room volume =

= 900 m^3/hour/45 m^3 = **20 ACH**

These measurements are done using the following: A tape measure, Vaneometer, smoke tube, calculator and a note pad.

Natural ventilation – advantages and disadvantages

The advantages of natural ventilation are: high ventilation rate, low construction and maintenance costs, and applicability to a wide variety of settings in hospitals such as waiting rooms, emergency departments as well as to other settings where TB transmission rates are high such as in prisons, shelters for the homeless, and ARV clinics.

The disadvantages are: ventilation is subject to climatic conditions. There is no control over the direction of contaminated air. Other challenges include noise pollution, lack of privacy for consultations and security.

Ultraviolet Germicidal Irradiation (UVGI)

Generally, UVGIs come under three different wavelength bands:

(1) UV-A long wavelengths (320-400nm)

(2) UV-B mid range (290-320nm)

(3) UV-C short (100-290nm) generally used for germicidal purposes

The principles of upper room UV air disinfection are to kill airborne organisms in the upper part of a room, and air disinfection by mixing air in the lower part of the room.

3.4 Personal protective equipment (PPE)

Generally, to protect the health care workers in the hospital environment standard measures such as hand washing, use of gloves, appropriate gowns, protective eye wear and various medical masks are suggested. In addition to standard procedures, appropriate PPE are recommended depending on the procedures performed and the type and duration of contact with infectious patients. Many aspects have to be considered while choosing PPE such as probable or confirmed TB diagnosis and corresponding requirements for prevention, (*e.g. airborne or droplet isolation*),the procedure to be adopted, the chances of contact with the patient's blood or other body fluids and whether the health care worker has any skin abrasions. Hand hygiene is a necessary part of using PPE.

During the interactive discussions, participants discussed the choice of PPE, possible scenarios for PPE use according to risk assessment, selection of PPE, sequence of wearing and removing PPE. The use of respirators in the TB programme was also discussed. Generally, respirators (N95 or FFP2) are recommended for all health care workers in high risk settings; lab technicians performing large volumes of smear microscopy, culture, DST and line probe assays and those working in MDR/XDR TB wards. Simple surgical masks need to be provided to TB patients in the intensive phase of treatment, and for MDR TB patients in the first year of treatment.

"Fit testing" of respirators and criteria for selection of respirators based on fit testing results, applicability of fit testing in various levels of health care settings, routine testing in field conditions, single use or repeat use, were also discussed. Routine fit testing is not recommended.

3.5 Waste management

Waste management guidelines and practices were discussed including the development of national-level waste management guidelines and training manuals for medical professionals. The experience from Nepal was used to illustrate measures that need to be taken. The Nepal Health Research

Council has developed national guidelines and based on the number and distribution of health care facilities and the estimated amounts of health care waste generated, developed a legal and institutional framework for management of waste by health care facilities.

4. Laboratory bio-safety

International guidelines and practical examples for implementation

M. tuberculosis infections are a proven hazard to laboratory personnel as well as others who may be exposed to infectious aerosols in the laboratory. An assessment by participants at a WHO South-East Asia Regional Workshop on Strengthening Laboratory Services for TB Control held in Bangkok in September 2007, showed that all 10 participating countries in the Region had laboratory related bio-safety issues to be addressed in their respective countries.

Bio-safety issues relating to the laboratory are addressed in many documents in a number of countries (Bangladesh India, Indonesia, Myanmar and Thailand). However, it is not clear whether they have included some of the recent tuberculosis laboratory-related bio-safety guidelines in their documents.

Guidelines for administrative controls in TB laboratories are based on the risk of exposure to laboratory-generated aerosols. Exposure to aerosols may occur during smear preparation, concentration procedures after decontamination, manipulation of liquid cultures for identification and DST, and during preparation of frozen sections. Accidental needle-stick injury is also a recognized hazard.

It is recommended that each laboratory should develop or adopt a bio-safety or operations manual.

Bio-safety cabinets, bio-safe centrifuges which come under primary barriers and personal protective equipments such as gloves, coats, gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles have to be provided. Facility design and construction (secondary barriers) including elbow or foot operated hand washing facilities, separation of the laboratory

work area from public access, and availability of a decontamination facility (e.g., autoclave), negative pressure facilities should be established preferably in separate buildings or modules to isolate the laboratory. Guidelines also include issuing of illness surveillance cards to laboratory staff after a satisfactory clinical assessment, indicating that the concerned staff is employed in a facility without a containment laboratory such as bio-safety Level 3 facility.

Administrative controls include development of policies and procedures for mycobacteriology laboratories, including policies for use of WHO recommended procedures and methods, SOPs for all procedures, waste disposal, safety strategies for prevention of aerosols and spill avoidance, spill response plan and recommended management of a spill. Chemical safety measures with regard to use of alcohol, avoidance of phenol toxicity, handling acids etc. require attention with regard to the bio-safety aspect.

Safety during specimen collection also needs to be ensured. Sputum collection should never be conducted inside the lab, but in a specified area. Bio-safety issues also relate to specimen transport, leakage and breakage associated with transporting specimens. It is necessary to establish a safe, fast and regular system for transport of specimens. Opening of sputum containers and preparation of smears leads to aerosol production and it is recommended that these be performed either near a flame or in a bio-safety cabinet.

Disinfection by discarding specimens in mycobactericidal disinfectants such as 5% phenol or 2% chlorine containing disinfectants is preferred over mycobacteriostatic disinfectants such as biguinides or quaternary ammonium compounds. Standard operating procedures for properly diluting commercially available disinfectants have to be given priority. Waste should be decontaminated as close to the point of use as possible, ideally before materials are removed from the laboratory area. Materials to be decontaminated outside the laboratory must be placed in a durable leak-proof container and closed before being transported. Special training in use of autoclaves is necessary to avoid injuries due to improper handling of these equipments.

Environmental controls include primary barriers such as bio-safety cabinets (BSCs), bio-safe centrifuges and secondary barriers such as facility design and construction. BSCs are not required for performing sputum

smear microscopy, but are necessary for cultures and drug susceptibility testing (DST). BSCs are classified into class I, II and III depending on the requirement for personal, product and environment safety. Care should be taken to perform all aseptic manipulations at least six inches within the hood to prevent the possibility of contamination from room air entering the hood. Movement of items inside a BSC work zone should be from a clean area containing supplies to the working area having supplements and specimens, and from there to the contaminated area containing waste container.

Evaluation of effectiveness of HEPA filters and their replacement, after fumigation of the BSC with formaldehyde gas, should be performed by the manufacturer or qualified professionals, with specifically calibrated equipment.

Centrifuges present unique problems for aerosol containment. Whenever potentially infectious materials are centrifuged, bio aerosol-containing equipment with airtight caps should be used and which should only be opened inside a BSC.

Bio-safety levels 1 to 4 include secondary barriers that are based on layout of the laboratory, availability of safe equipment and laboratory practices to be followed. Practices such as controlled access to the laboratory, foot or elbow-operated hand washing sinks; autoclaves for waste decontamination should be placed near or in the facility itself with horizontal double-door autoclaves, where-ever possible and if funds permit. Performance testing is done at least once a year for BSC and negative pressure units. Some of the tests and their values are; air flow - 0.45 m/sec to 0.65 m/sec; inflow velocity test for BSC Class II A2 of 100 liters/per minute. Smoke test results should indicate that no smoke is going out of BSC once drawn in and there is no leak in the HEPA filter cabinet when performing leak tests. The particle count should have an aggregate of less than 3530 particles per cubic meter of 0.5 microns and larger, noise level of less than 65dB on an A scale, and vibration levels of less than 2.5 microns. For a negative pressure facility, the airflow of at least 12 ACH with negative is pressure of 15-25 Pascal are required. Replacement of pre-filters for BSC is done at least once in six months and HEPA filters of BSC and/or negative pressure unit is done at least once a year.

Personnel protection is ensured by training lab personnel in infection control in the laboratory and by monitoring of equipment. Personnel must confirm that air flow is unidirectional through the facility and that negative air-pressure gradients are maintained.

Laboratory personnel must be trained to wear laboratory coats or gowns over their street clothes, removing them when leaving the laboratory. Gloves should overlap the sleeves of the gowns.

Surgical masks do not filter out infectious droplet nuclei. N95 respirators are adequate protection but in standard conditions negative-pressure should confer adequate protection and respirators are compulsorily required in case of spill cleaning.

The checklists that may be included in the monitoring and evaluation guidelines are: availability of recent National TB laboratory bio-safety guidelines: integration of national TB laboratory bio-safety guidelines with national bio-safety guidelines, inclusion of laboratory bio-safety aspects, including 'Illness surveillance' in supervision checklists for national, regional and peripheral level laboratories, training of all laboratory staff in bio-safety and annual refresher training of all laboratory staff in bio-safety.

5. Monitoring and evaluation of infection control measures

The monitoring of infection control (IC) measures in health care facilities (HCF) starts with checking for the availability of a plan for IC for the country and whether a person has been identified for implementing the IC policies in all HCF and congregate settings, checking for availability of national guidelines, training curriculum and availability of national level M&E plan and framework. The check-list includes the input indicators and process indicators for the three components of IC namely administrative, environmental and personal protection.

For monitoring administrative measures, all the HCF will be monitored for separation of TB suspects on arrival, waiting time for patients in HCF and monitoring of TB among health care workers. The implementation of these measures is expressed as the proportion of HCF following the IC practices/total health facilities.

For environmental controls, ventilation in waiting areas, the use of mechanical or mixed mode ventilation, presence of UVGIs and SOPs for bio-safety cabinet in the laboratories are to be checked as input indicators. The process indicators would be the number of HCF with the minimum required number of air exchanges, availability of UVGIs and HEPA filters that are properly maintained.

For respiratory protection, the input indicators would be provision of N95 masks to health care workers, SOPs on qualitative 'fit testing' of N95 masks and SOPs on use of respirators. The process indicator would be the number of health care workers correctly using N95 masks and the number of HCWs 'fit tested'.

Regular M & E of infection control measures is very important to ensure that these are in place, to prevent ongoing transmission of TB in the community and to protect health care workers.

6. Hands-on training for the participants through field visits

Field visits to observe and practice TB infection control measures, made this workshop very hands-on.

Participants conducted a facility-risk assessment and developed a facility plan for airborne infection control measures. They were asked to review the use of available spaces and consider renovation and/or construction to optimize environmental controls.

Participants assessed the risk for transmission of *M. tuberculosis* in two health-care settings in the field. The evaluation started with considering factors such as the community rate of TB, number of TB patients encountered in the setting, and the speed with which patients with possible TB were identified, isolated, and evaluated. They then determined the types of administrative and environmental controls and respiratory protection needed for the given setting.

The participants got a good idea on how to approach an assessment on their own as they had the opportunity to visit two health facilities namely NATA (Nepal Anti Tuberculosis Association) a referral centre with accommodation for up to 25 in-patients, and GENETUP, which is an NTP

Referral Centre for TB outpatients only. Participants in four groups visited the wards, waiting areas outside the OPD and laboratory, and were instructed to do their own assessments. They were encouraged to make a presentation and discuss existing measures and measures to be introduced. After the site visits participants were given two exercises. The first exercise included the upgradation and improvement of an imaginary facility and the second exercise was to prepare a debriefing of their assessment to one of the health facilities visited.

As most participants were doctors and/or other medical staff, it was suggested that they could follow-up and educate technicians/technical departments at national level on improving administrative and environmental controls in the specific local environments on return to their home countries.

7. Conclusions and recommendations

(1) Due to the increasing importance of specific measures for respiratory infection prevention and control including TB and MDR-TB/XDR-TB, it is necessary to have a reappraisal of infection control policies and implementation plans in health-care and congregate settings;

(2) In the above-mentioned context, most of the participating countries did not have a comprehensive policy or measures to prevent TB transmission in healthcare facilities;

(3) Absence of appropriate infection control policies and practices create a favourable environment for transmission of respiratory infections including TB among hospital patients, hospital workers and the community particularly in high-risk settings;

(4) Therefore, there is an urgent need to re-focus attention on TB infection control, particularly in high-risk settings such as ill ventilated, over-crowded, large out-patient departments, in-patient facilities particularly TB & MDR-TB wards, prisons, specimen collection areas and other congregate settings;

(5) A WHO policy on infection control is available for countries to adapt and prepare their country-specific IC policies and plans;

(6) A standardized WHO training package on Integrated Respiratory Infection Prevention and Control (RIPC) in healthcare settings is also available and may be adapted for use by NTPs.

Recommendations

For WHO-SEARO

(1) To establish an integrated Regional Infection Control Technical Advisory Group;

(2) To develop a database and network of IC experts to provide technical assistance to countries;

(3) To provide technical assistance for development of country-specific IC plans, SOPs and training modules including TB laboratory bio-safety policies and plans;

(4) To assist Member States in building capacity of engineers/ architects resource persons to take care of IC control plans including TB laboratory bio-safety issues; and

(5) To explore the possibility of making available a list of products for environmental and personal protective equipments with standard specifications.

For Member States

(1) To include IC as part of TB control strategies and policies;

(2) To establish coordinating bodies for TB infection control at national level;

(3) To perform situational analysis for implementation of IC plans including laboratory bio-safety practices;

(4) To develop country-specific IC plans, SOPs, training modules including TB laboratory bio-safety policies and plans and integrate them into their respective national IC policies and plans;

(5) To establish and implement routine TB surveillance among health care workers;

(6) To identify financial resources for implementation of TB IC plans such as environmental controls and personal protective equipment and undertake HR development in TB IC for various levels of health care facilities; and

(7) As a long-term goal, include respiratory infection prevention and control policies and plans in the educational curricula of medical, laboratory and nursing schools/ colleges.

Annex 1

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Annex 2

Agenda

1. Background to the workshop, objectives and expected outcomes
2. Introduction to TB transmission and pathogenesis
3. Introduction to IC policy; Overview and Administrative/Managerial Controls
4. Environmental (Engineering) Controls
5. Laboratory biosafety – international guidelines and practical examples of simple implementation
6. Waste management – Country guidelines and practices
7. Personal respiratory protection
8. Field visits: Infection control practice and environmental assessment checklist
9. Programmatic approach to infection control planning, and country examples
10. Opportunities for linking with pandemic influenza infection control activities: Introduction to the integrated Respiratory Infection Prevention and Control (RIPC) training curriculum for front-line health care providers
11. Presentation of the environmental measures and respiratory protection sections of the TB-IC strategic plans
12. Course evaluation

Annex 3

Recommended reading

(1) Do AN, Limpakarnjanarat W, Uthaivoravit PLF, et al. Int J Tuberc Lung Dis 1999; 3:377-81.

(2) Joshi R et al. PLOS Medicine 2006; 3(12):2376-2391.

(3) Yanai H, Limpakarnnanarat K, Uthaivoravit W, et al. Int J Tuberc Lung Dis 2003;7:36-45.

(4) Boch N et al; JID 2007: 196; S108-113.

(5) Godfrey-Faussett et al. Tuberculosis control & molecular epidemiology in a South African gold-mining community. Lancet 2000; 356:1066.

(6) Granville-Chapman, J et al. BMJ 2007; 335:1293.

(7) Guidelines for the Prevention of Tuberculosis in Health Care Facilities in Resource Limited Settings, WHO/CDS/TB/99.269.

(8) Tuberculosis Infection Control in the Era of Expanding HIV Care and Treatment, 2003 Addendum to WHO/CDS/TB/99.269.

(9) WHO Policy on Tuberculosis Control in Health Care Facilities, Congregate Settings and Households, WHO/HTM/TB/2009.419.

(10) Bio-safety in Microbiological and Biomedical Laboratories U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control and Prevention and National Institutes of Health, Fifth Edition, 2007.

(11) Laboratory bio-safety manual, Third edition, World Health Organization, Geneva, 2004, WHO/CDS/CSR/LYO/2004.11.

(12) McIntosh IBD, Morgan CB, Dorgan CE. ASHRAE laboratory design guide. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc; 2001.

(13) Guidelines for the safe transport of infectious substances and diagnostic specimens, WHO, 1997, WHO/EMC/97.3.

TB infection control is a combination of measures aimed at minimizing the risk of TB transmission. The foundation of infection control is early and rapid diagnosis, and proper management of TB patients. The regional workshop on infection control to prevent TB transmission in health facilities was organized in Kathmandu, Nepal from 14 – 18 September 2009. The specific objectives were to review current technical guidelines and share experiences on best practices to prevent nosocomial transmission of TB, identify appropriate interventions for infection control at different levels of health facilities and plan for the integration of components of infection control within national TB control plans.

At the end of the workshop it was concluded that due to the increasing importance of specific measures for respiratory infection prevention and control, it is necessary to have a reappraisal of infection control policies and implementation plans in health-care and congregate settings. Several recommendations for action in countries and for WHO were made in this regard.

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