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The Armenian SORT IT Course

A country-wide evaluation of infection control for tuberculosis in health-care facilities in Armenia

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Abstract

Introduction: Infection control at health facilities is an important part of TB control programmes. To assess the implementation of tuberculosis infection control (TB IC) measures and barriers hindering their implementation in TB health care facilities (HCFs) in Armenia; to report the feasibility of using the WHO recommended checklist.

Methodology: A cross-sectional survey using WHO TB-IC checklist and direct observations was conducted between January and May 2018.

Results: The survey included all 62 TB institutions in Armenia. TB HCFs in Armenia had implemented some recommended TB IC measures: offering IC training to staff (48%), shortening time to diagnosing TB to less than one day (29%) and ensuring good ventilation (60%). N95 respirators were available in all HCFs. However, barriers that hindered implementation of TB IC measures were: lack of training, a different incentive model for primary care doctors versus TB doctors and lack of space and poor conditions of the building.

Conclusion: The use of the standardized WHO checklist in this first evaluation of TB IC measures in Armenia was found to be useful and feasible in identifying areas of weak IC implementation and barriers to achieving good infection control. Other TB programs may benefit from the use of this model of assessment, based on the WHO checklist.

Key words: Implementation; TB health-care facilities; barriers; operational research; SORT IT.

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Introduction

Tuberculosis (TB) is a global public health problem. It is estimated that almost 10.4 million people were infected with TB and approximately 1.4 million died from TB in 2017 [1]. More than 80% of active TB cases in the world are concentrated in low and middle-income countries (LMICs) where the risk of ongoing transmission is a concern [2,3]. Armenia is among the countries with a high burden of TB. According to 2017 estimates, the TB (including HIV/TB) incidence rate in the country was 36 per 100,000 population and the TB mortality rate was 1.2 per 100,000 population including HIV-positive cases. Armenia is also among the 27 countries with a high burden of multidrug-resistant tuberculosis (MDR TB – defined as resistance to at least rifampicin and isoniazid) [4].

The risk of TB transmission is high in health-care facilities (HCFs), especially among those that do not have effective infection-control measures in place [5,6]. Tuberculosis infection control (TB IC) in HCFs thereby remains a public health priority. To reduce this risk of transmission, the World Health Organization (WHO) has defined a set of infection control guidelines to be implemented at HCFs catering to TB patients [7,8]. To

facilitate the implementation of this guideline and for routine monitoring of infection-control (IC) practices at HCFs, WHO has also developed a checklist for use by healthcare workers working in these facilities and for external monitors [9,10]. However, data about the implementation of this checklist are scarce [9]. Effective implementation of IC in HCFs will not only help reduce TB transmission, but it will also help increase the confidence of patients and the community and the motivation of healthcare workers in the HCFs as it has a direct implication on health worker safety [10].

In Armenia, TB care is provided through outpatient and inpatient services spread throughout the country. TB management follows WHO guidelines and services are provided free of cost under the umbrella of the National TB control program (NTCC) [11]. Since 2015, the program has strived to establish a continuing quality improvement system to raise the quality of services being provided to patients in the country [12]. Infection control is an important part of this system. However, no data about infection control practices are available from Armenia or the East European and Central Asian (EECA) region.

Hence, this study was conducted to assess the implementation of TB IC measures (managerial, administrative, environmental and personal protective measures of infection control) in TB HCFs across Armenia in 2018 and to understand the barriers in the implementation of these measures so as to inform the way forward; Also, to report on feasibility in using the WHO recommended checklist.

Methodology

Study design

This is a cross-sectional survey using direct observations and structured interviews.

Study setting

Armenia is a landlocked country at the crossroads of Southeastern Europe and Western Asia and belongs to the European Region of WHO. The population of Armenia is about three million [13]. In 2016, the World Bank classifies Armenia as an upper middle-income country with a GDP of 10.55 billion dollars, and literacy rate of 99.8 %. Nevertheless, among the WHO European region, the country ranks 18 in the high priority countries fighting TB [14,15].

National Tuberculosis Control Center (NTCC)

The NTCC is a part of the Ministry of Health of Armenia and is responsible for the implementation and monitoring of TB care services across the country. There are five inpatient TB centers in different parts of the country. MDR-TB patients are admitted here for the intensive phase of their treatment. Treatment for drug-sensitive TB (DS-TB; defined as sensitivity towards rifampicin and isoniazid) is mainly ambulatory [16]. However, DS-TB patients can also be admitted to these facilities if required. The 2014 reform in TB finance reduced unnecessary hospitalization and introduced performance-based financing mechanisms to provide additional incentives for primary doctors and encourage outpatient care [17].

In 2011, 72 outpatient facilities served the 11 administrative regions of Armenia. The clinics vary in a number of ways, including the population covered, staffing levels, and the availability of onsite direct sputum smear microscopy. But all outpatient units have the necessary equipment or affiliations with adjacent laboratories in order to perform diagnostic tests and confirm TB diagnosis. TB diagnosis and care is provided through outpatient as well as inpatient services based on the directly observed treatment (DOT) strategy. Meanwhile, in 2014, health system reforms resulted in a consolidation of the TB treatment facilities and the number of outpatient units was reduced to 57.

Study population

The study included all tuberculosis HCFs across Armenia: 57 outpatient TB centers and five inpatient departments in regional general hospitals providing TB.

Data collection

Data was collected between January and May 2018 through a facility-level survey and direct observations in all TB HCFs. The TB IC questionnaire was based on the WHO TB IC guideline. The questionnaire consisted of 23 questions divided into four parts, namely – managerial, administrative, environmental and personal protective equipment. It also included facility characteristics (e.g., level, type and the number of staff) and TB patient load. The numbers of outpatients and inpatients with TB were obtained from the national TB electronic database for 2017.

Trained staff from the NTCC conducted the survey. The survey team were trained to ensure a unified and standard approach towards the interviews. The training was conducted by the head of monitoring and evaluation department at the NTCC.

All interviews were conducted in collaboration with the head of the TB HCFs and in their absence, the IC focal person. They answered the survey questions and

provided additional data on facility characteristics. In addition, the research team assessed the location of sputum collection facilities, patient triage area, the waiting area for presumptive TB patients, and the use of N95 respirators by HCWs during on-site visits in all HCFs. When IC measures were not implemented, staff were asked to give their opinions on why this was so. Answers were recorded from a list of seven options such as lack of funds, training, motivation, knowledge, enforcement, and training along with "other". "Other" information was transcribed in Armenian and then translated into English.

Data was collected on paper forms and was later double entered by two different data encoders into Microsoft Excel 2016. Any inconsistencies identified while matching the databases were resolved by checking the data source. Random checks were carried out to ensure data quality during data entry.

Data analysis

Data analysis was performed using the Stata14 software package (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP). The proportions of compliance and non-compliance for each item of the checklist were calculated for all the TB HCFs.

Data pertaining to the reasons for non-compliance with the checklist was analyzed and coded by the principal investigator. Codes were grouped into categories according to the WHO TBIC questionnaire groups, namely, organizational problems, lack of motivation, and structural issues. Data coding and analysis were done manually.

Ethics approval

The study was approved by the institutional Ethics Review board of Center of Medical Genetics and Primary Health Care, Yerevan, Armenia (approval reference number: CMG-2018-025).

Results

A total of 62 TB HCFs were included in the study. Among them, five facilities were providing inpatient care, while the remaining were outpatient clinics. Key characteristics of the TB HCFs across the country are summarized in Table 1. All HCFs surveyed had at least one doctor and a nurse, with a median of six nurses for the inpatient facilities. Only 22 (35%) of the TB HCFs had TB diagnostic laboratory facilities on site. The median annual number of patients visiting the outpatients' clinic was 11 (IQR: 5-22), which is less than one patient a month. For the inpatient facilities, it was less with a median number of four (IQR: 2-8) admitted annually.

Managerial measures

Among all the TB HCFs, 57 (92%) had a written TB IC plan (Table 2). However, clinical staff in only 30 (48%) HCFs had received documented TB IC training. Having a trained IC focal person was significantly associated with clinical staff having received TB IC training ($\chi 2 - 5.34$, $p < 0.05$). Having a budget allocated to IC activities was not found to be significantly

Table 1. General characteristics of tuberculosis (TB) designated health-care facilities in Armenia, 2018.

	Results n (%)
TB health-care facilities	62
Clinic location	
Capital city	9 (15)
Other cities and rural areas	53 (85)
Onsite inpatient facility	5 (9)
Onsite diagnostic laboratory	22 (35)
Median number of doctors outpatient clinics (IQR)	1 (1-3)
Median number of doctors in inpatient facilities (IQR)	1 (1-4)
Median number of nurses in outpatient clinics (IQR)	1 (1-3)
Median number of nurses in inpatient facilities (IQR)	6 (5-24)
Median number of infection control staff in outpatient clinics (IQR)	1 (1-3)
Median number of infection control staff in inpatient facilities (IQR)	1 (1-4)
Median number of TB patients registered at the outpatient clinic in 2017 (IQR)	11 (5-22)
Median number of TB patients registered at the inpatient facility in 2017 (IQR)	4 (2-8)

TB = tuberculosis; IQR = interquartile range.

associated with TB IC training of staff. In the open-ended questions, two-third of the staffs reported lack of training and when it was available is was only provided for the doctors.

Administrative measures

Information about TB was readily available and offered by staff to presumptive TB patients in almost all facilities (60, 97%). All clinics initiated treatment within one day of confirmation of TB status. However, only in 18 (29%) clinics, was the median time for diagnosing TB less than one day. Having an onsite diagnostic lab was significantly associated with TB diagnosis within a day ($\chi 2 – 15.66$, $p < 0.0001$). The staff reported that delayed diagnosis was due to the differentiated incentive models for the primary care doctors and TB doctors. . A majority of staff did not understand the meaning of using possible stigmatizing language.

Environmental measures

In almost all clinics (58, 94%), the waiting areas were not crowded and patients were given enough space. More than half (37, 60%) of the clinics had waiting areas that were well ventilated. We did not find any factors statistically associated with poor ventilation at HCFs. However, staff most commonly cited the conditions of the building as a barrier to provide proper ventilation.

Personal protection measures

All facilities supplied HCWs with N95 respirators with almost all clinics (59, 95%) conducting fit testing for these respirators and training staff in proper use of these respirators.

Table 2. Implementation of infection control measures in 62 Tuberculosis (TB) health-care facilities in Armenia, 2018.

Infection control measures	Implementation n (%)
Managerial infection control	
Written facility-specific infection control plan	57 (92)
Budget allocated for TB infection control activities	55 (89)
Designated person responsible for implementing TB infection control practices	57 (92)
Designated TB infection control focal person has received documented TB infection control training	43 (69)
All clinical staff have received documented TB infection control training	30 (48)
TB symptoms occurring among staff are immediately investigated and, if TB is diagnosed, treated and registered in a confidential register	57 (92)
Health education regarding coughing etiquette and respiratory hygiene for patients	58 (94)
Administrative infection control*	
TB information for patients is readily available and offered by staff	60 (97)
Supplies are readily available for coughing patients and are being used	61 (98)
A package of HIV and HIV-associated TB prevention and care is available for facility staff	61 (98)
There is a tracking mechanism for monitoring turn-around time from TB screening to diagnosis and from TB diagnosis to treatment initiation	60 (97)
Median time between screening positive for TB symptoms and actual diagnosis is no more than one day	18 (29)
Median time between actual diagnosis and treatment initiation is no more than one day	62 (100)
Rapid diagnostic test	62 (100)
HIV testing is offered to everyone with TB	58 (94)
Facility design, patient flow and triage system compliance	54 (87)
Environmental infection control	
Waiting area is well ventilated	37 (60)
Patients are not crowded in waiting areas	58 (94)
Sputum samples collection in a well-ventilated area	47 (76)
Hospitalized TB cases are isolated or grouped according to drug sensitivity status in rooms (n=5)	3 (65)
Personal respiratory protection	
Respirators are readily available for staff for MDR TB patients	62 (100)
Staff members have been trained for use of respirators	59 (95)

TB = tuberculosis; *All information and education material is systematically checked to prevent the inclusion of stigmatizing language.

Discussion

This is the first nationwide TB IC survey conducted in Armenia and possibly in the EECA region that evaluated the implementation of TB IC measures and the barriers encountered among all TB HCFs. The study found that all TB HCFs in Armenia had a written TB IC plan and personal protective equipment. However, training offered to all staff on TB IC needed improvement. TB IC measures which were not fully implemented were delay in the diagnosis of TB for more than a day and some waiting areas were poorly ventilated. Barriers reported to the implementation of TB IC measures were lack of training, a differentiated incentive model for primary care doctors versus TB doctors and lack of space and conditions of the building.

Studies in LMICs suggest that the diagnostic delay of TB can enhance the transmission of infection, increase the morbidity and mortality of TB; it was one of the foundations of IC which was not well implemented in our study [18]. Furthermore, poorly ventilated areas being used by the potentially infectious patients can be conducive for TB transmission. Appropriate renovation, and optimal use of these HFCs are crucial to IC. A study conducted in China indicated that the TB prevalence in HCWs was higher than that in the general population due to poor ventilation in waiting areas in the HCFs [19]. However, often in countries with a high prevalence of TB, HCFs cannot effectively implement ventilation measures due to limited space and budget constraints [20]. Studies documenting the increase of the nosocomial transmission of TB have emphasized the need for HCFs to implement effective TB IC measures [21,22].

A Russian study showed that the implementation of administrative and environmental control measures such as having the median time for diagnosing TB less than a day and initiating treatment within one day after confirming TB status reduced transmission of TB in HCFs and minimized the fear of contracting TB while attending the facilities. Before 2016, TB IC in HCFs was mainly neglected and the prevalence of TB in HCWs was used as a proxy to assess the effect of IC measures [23]. The new WHO TB IC policy recommends identifying the knowledge gaps in effectiveness and efficacy of IC measures in TB HCFs [24]. This study identified the key elements that need to be addressed in Armenia, such as lack of IC training for HCF staffs and allocation of adequate resources to the renovation of buildings and improved use of space. In addition, scaling-up of TB IC measures and routinely monitoring the implementation by questionnaires and indicators would be a step forward in achieving safer TB HCFs for all [25].

The study strengths are that we evaluated all TB HCFs in Armenia and used a standardized WHO checklist to assess the implementation of IC. The study also followed the STROBE guidelines [26]. There were some limitations. We only assessed the availability of IC measures and were unable to differentiate the quality or consistency of implementation of all measures. We did not objectively measure the ventilation of the facilities using anemometers [27]. The qualitative findings from the facility staffs are not generalizable, but together with the quantitative data, did address ways forward [28,29]. We could not get reliable answers to one of the questions, so that it was excluded from the analysis.

In practical terms, for Armenia, the barriers that hinder implementation of TB IC measures such as capacity building of HCWs, diagnostic delay, and poorly ventilated areas need to be addressed. Although the Armenian government reformed financing mechanisms for TB health-facilities, which had a favorable effect on the treatment success rate, attention also needs to be directed to capacity building, rapid diagnosis, and structural issues. As TB IC measures are an important component of any global or national TB prevention and control program, systematic monitoring and follow-up implementation are needed to protect both patients and HCWs.

Conclusion

This study showed that although many TB IC measures had been implemented by the TB facilities in Armenia, some measures like infection control training for the clinical staff, early diagnosis of TB and ventilation of waiting areas need to be strengthened. Use of the standardized WHO checklist to assess IC measures provided a baseline to assess future progress especially in areas of weak implementation. Other countries fighting TB may benefit from the use of this model of assessment of their TB IC activities to identify gaps, based on a WHO checklist.

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