

Evaluation of Tuberculosis Situation in Economic Cooperation Countries in 2009; Achievement and Gaps toward Millennium Development Goals

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ABSTRACT

Background: Evaluating the tuberculosis (TB) status of the Economic Cooperation Organization (ECO) member countries relation to goal 6-c of the third millennium, which includes that TB incidence, prevalence, and death rates should be halved by 2015, compared with their level in 1990.

Methods: In 2009, we have critically reviewed the countries' Millennium Development Goals (MDGs) reports and extracted the data from the surveillance system and published and unpublished data. The main stakeholders, from both governmental and international organizations in the country have been visited and interviewed by the research team as part of the data validation process.

Results: The TB incidence is very heterogeneous among ECO countries, which differ from 21.7 in Iran to 230.7 per 100,000 in Tajikistan. TB incidence (per 100,000) is more than 100 in six countries and is from 50 to 100 in two countries and is less than 30 in two countries. Only in two countries the crude death rate (CDR) is higher than 70%. In seven countries the death rate is higher than 10 per 100,000. Two countries are among the 20 top world countries with the highest tuberculosis burden.

Conclusion: There are some signs and signals indicating the bad condition of an ECO member including: incidence of more than 50 per 100,000, CDR of less than 70%, death rate more than 10 per 100,000, and rating two member countries among 20 top countries with the highest burden in the world. Iran and Turkey could achieve MDGs by 2015, but if other countries do not prepare urgent intervention programs, they will not be able to fulfill the goals.

Keywords: Evaluation, incidence, tuberculosis

INTRODUCTION

As before, tuberculosis is regarded as an important problem and a disease threatening public health, which must not be ignored. Although investigation of the annual trend of tuberculosis in the world reveals a slight decrease in tuberculosis

incidence and mortality rate, there is no vivid perspective for tuberculosis control in the world. In addition, although there is a decrease in tuberculosis indicators in the world, there is a high difference in tuberculosis incidence and mortality rate in different parts of the world.^[1,2] Tuberculosis has a high burden, about two billion of the world people are infected with *Mycobacterium tuberculosis*, and only in 2006, about 9.2 million people were afflicted with the disease and 1.7 million people died due to it.^[1-3] Despite all the optimism that emerged for tuberculosis control at the end of the 1980s, the emergence of two major challenges with regard to this disease, dashed all this optimism. At present, the two major challenges associated with the tuberculosis program consist of tuberculosis Human Immunodeficiency Virus (HIV) / Acquired Immune Deficiency Syndrome (AIDS) co-infections and multi drug-resistant (MDR) tuberculosis. The second leading cause of death in people with AIDS is TB. About 500,000 MDR-TB cases have been reported in 2007 alone.^[3-7] Considering the high burden of tuberculosis in the world and also the role of social infrastructures in controlling this disease, tuberculosis has been selected as part of goal number six of the Millennium Development Goals (MDGs), and achieving tuberculosis control indicators is regarded as a development criterion of the countries. On account of this important role of tuberculosis control in human health, important strategic plans have been drawn up in the world and have been offered for tuberculosis control by the World Health Organization and other international organizations. Directly Observed Treatment, Short Course (DOTS) and Stop TB are among two important tuberculosis control programs across the world. The execution of the activities thereof are looking beyond the decrease of tuberculosis incidence and mortality up to 2015, that is, it is aiming at tuberculosis elimination.^[8-10] Millennium Development Goals consist of eight common goals selected by leaders of the world's nations as development goals in the UN, in 2000, and the achievement of these goals has been defined as 2015. These goals have been recognized as goals that implement the solutions related thereto, providing the possibility of the development of the world's nations. The countries have committed to take measures for implementing activities in line with achieving these goals. Indicators have

been developed for each goal, to evaluate the achievement of these goals. Goal numbers four, five, and six are related to the health area and in goal six, which is related to combating diseases, two of the ten indicators are related to tuberculosis control.

Global TB control has the following main targets: (a) The incidence of TB falling by 2015 (MDG Target 6.c), (b) halving TB prevalence and death rates by 2015 compared with their level in 1990, (c) detecting at least 70% of the incident smear-positive cases and treating them in DOTS programs, and (d) treating at least 85% of the incident smear-positive cases successfully. Occurrence of less than one case per million population per year, by 2050, is the ultimate goal of eliminating TB.^[11,12]

The Economic Cooperation Organization (ECO) is a regional organization. Ten countries of Iran, Pakistan, Turkey, Afghanistan, Azerbaijan, Kazakhstan, Turkmenistan, Kyrgyzstan, Uzbekistan, and Tajikistan are members of the ECO. This organization is located in the Middle East and central Asia and the member countries, with a population of 330,000,000 million people, have high cultural, social, and historical resemblance.^[13]

This study aims at investigating tuberculosis combatant indicators and evaluating the achievement of goals and indicators related to tuberculosis and evaluating the activities related to tuberculosis in MDGs, in the ECO member countries, in 2009.

METHODS

This study is a cross-sectional study carried out in 10 ECO member countries, in 2009. The following activities were taken for collecting the necessary data.

A review of the MDG reports of the ECO member countries.

A review of the statistics, indicators, reports, and texts related to four, five, and six MDG goals of each country, in the national and international organizations.

Visiting ECO member countries by researchers and carrying out interviews with the national and international organization's authorities and experts related to health in that country.

A review of published and unpublished reports and documents of the Ministry of Health and health-related international organizations in that country.

A review on articles related to the research subject in scientific databases.

After collecting the related data through these methods in each country, the data was investigated and some criteria were defined for selecting the final data. The selected final data were investigated and an analysis of the indicators achievement status was done. The desired outcome of this study was 6 – 9 and 6 – 10 indicators of the MDGs program. These indicators are two out of the ten indicators of goal six of the MDGs program related to tuberculosis. The definitions used for evaluation of these goals are as follows:

These two indicators are as follows:

1. 6–9 indicators: Prevalence and death rates associated with tuberculosis
 - Tuberculosis prevalence: The number of people with tuberculosis are considered as per 100,000 population
 - Death rates associated with Tuberculosis are considered as per 100,000 population
2. 6–10 indicators: Proportion of tuberculosis cases detected and cured under DOTS (Directly Observed Treatment Short Course)
 - Tuberculosis case detection rate: Proportion of detection of newly diagnosed tuberculosis cases to the estimated cases in regions under cover of DOTS program
 - Treatment success rate: Proportion of new smear positive cases with complete treatment under DOTS program

These indicators are usually used for monitoring and evaluating the tuberculosis program in MDGs and other international organizations.

1. Evaluation and measurement of 6–9 indicators is carried out on the basis of the following indicators:
 - Tuberculosis Incidence rate (all cases - smear positive) per 100,000 population per year
 - Tuberculosis Prevalence rate (all cases - smear positive) per 100, 000 population per year
 - Death rate associated with Tuberculosis per 100,000 population per year
2. Evaluation and measurement of 6–10 indicators is carried out on the basis of the

following indicators:

- Proportion of detection of tuberculosis cases (smear positive and total)
- DOTS program coverage
- Treatment success rate
- In this investigation, we have compared the existing indicators in ECO countries.

RESULTS

The results of this study are divided into two parts. One part includes results related to the evaluation of 6–9 indicators, that is, the incidence, prevalence, and death rates associated with tuberculosis, which are mentioned in Tables 1-3. Another part is related to the evaluation of 6–10 indicators, that is, proportion of tuberculosis cases detected and cured under the DOTS program, which are mentioned in Tables 4 and 5. These results are shown in the tables.

Table 1: Incidence of all forms of tuberculosis cases in a 100,000 population in ECO countries (1990 – 2007)

Country	1990	1995	2000	2005	2007
Afghanistan	168.3	168.3	168.3	168.3	168.3
Azerbaijan	35.3	49.6	75.4	76.6	77.1
Iran	35.8	39.7	30.9	23.7	21.7
Kazakhstan	58.4	61.8	141.2	137.1	129.0
Kyrgyzstan	54.9	76.9	134.9	123.9	121.3
Pakistan	181.3	181.3	181.3	181.3	181.3
Tajikistan	111.8	64.8	117.4	192.2	230.7
Turkey	49.4	39.7	31.3	28.9	29.6
Turkmenistan	64.2	52.4	92.3	69.8	68.5
Uzbekistan	68.4	76.3	92.7	117.5	112.6

ECO: Economic cooperation organization

Table 2: Prevalence of all forms of tuberculosis cases in a 100,000 population in ECO countries (1990 – 2007)

Country	1990	1995	2000	2005	2007
Afghanistan	436.5	397.3	345.9	266.6	238.3
Azerbaijan	57.6	76.1	113.3	85.0	86.4
Iran	49.6	54.9	39.5	30.6	27.4
Kazakhstan	94.5	94.0	140.7	147.5	139.3
Kyrgyzstan	89.5	118.0	156.2	136.1	134.4
Pakistan	429.7	422.3	412.9	289.4	222.6
Tajikistan	193.2	105.7	191.5	282.0	321.9
Turkey	82.9	61.8	48.7	44.3	33.6
Turkmenistan	104.8	80.4	130.2	91.0	75.2
Uzbekistan	113.6	119.3	139.0	143.6	140.5

ECO: Economic cooperation organization

Table 3: Death rate associated with tuberculosis per a 100,000 population in ECO countries (1990 – 2007)

Country	1990	1995	2000	2005	2007
Afghanistan	49.6	45.6	40.7	32.9	30.1
Azerbaijan	5.1	7.1	10.1	10.3	10.4
Iran (Islamic Republic of)	4.2	4.6	3.6	2.8	2.6
Kazakhstan	7.8	8.3	15.4	18.4	17.4
Kyrgyzstan	8.0	11.2	19.7	18.2	17.9
Pakistan	49.3	49.0	48.6	37.5	29.0
Tajikistan	20.4	11.9	22.6	37.7	45.5
Turkey	8.5	6.8	5.3	4.6	5.1
Turkmenistan	9.3	7.6	13.5	10.2	9.3
Uzbekistan	9.8	11.0	12.5	16.2	16.4

ECO: Economic cooperation organization

Table 4: Treatment success rate (percent) under the DOTS program in ECO countries (1995 – 2006)

Country	1995	2000	2005	2006
Afghanistan		85.5	89.7	84.4
Azerbaijan		90.8	59.1	59.6
Iran (Islamic Republic of)		85.3	82.5	83.0
Kazakhstan		78.6	71.1	72.1
Kyrgyzstan		82.2	84.7	82.2
Pakistan	70.4	74.5	83.3	88.0
Tajikistan			86.2	84.4
Turkey			89.5	90.7
Turkmenistan		69.5	81.1	83.7
Uzbekistan		80.5	80.5	80.6

ECO: Economic cooperation organization, DOTS: Directly Observed Treatment Short Course

Table 5: Tuberculosis case detection rate (percent) under the DOTS program in ECO countries (1990 – 2007)

Country	1995	2000	2005	2007
Afghanistan		18.4	52.4	64.3
Azerbaijan	5.2	5.5	54.5	46.5
Iran (Islamic Republic of)	42.3	58.4	62.3	68.1
Kazakhstan		93.8	74.0	69.1
Kyrgyzstan		41.9	65.8	59.6
Pakistan	1.0	2.8	37.6	66.7
Tajikistan			23.0	29.9
Turkey			2.7	75.6
Turkmenistan		17.0	43.6	84.2
Uzbekistan		4.2	37.5	45.0

ECO: Economic cooperation organization, DOTS: Directly Observed Treatment Short Course

- Evaluating 6–9 indicators in ECO member countries: Results presented in Tables 1, 2, and 3
- Evaluation of 6–10 indicators in ECO member countries Results presented in Tables 4 and 5

DISCUSSION

On the basis of our findings, the ECO member countries may be divided into two categories with regard to tuberculosis.

First category: Countries where tuberculosis incidence and prevalence has decreased in 2007, in comparison with 1990 and 2000. Turkey and Iran are two countries in this category.

Second category: Countries where tuberculosis incidence and prevalence has increased in 2007, in comparison with 1990. Afghanistan, Azerbaijan, Pakistan, Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan, with more than 100 incidences rate per 100,000, have greater problems in achieving the MDG targets. These countries are divided into two groups:

1. Countries where tuberculosis incidence and prevalence has almost remained fixed since 1990. Two countries of the regional countries fall in this category. Of course, these two countries are among the 20 top world countries with the highest tuberculosis burden.^[14]
2. Countries where tuberculosis incidence and prevalence has increased since 1990. Six countries are in this category.

These findings reveal that tuberculosis control programs in the ECO countries are not in a proper situation. Considering the high incidence of the disease in many countries, achieving the desirable goals by 2015 seems far-fetched.

From among ECO member countries, two countries are among the 20 countries of the world with the most tuberculosis burden. These two countries are Afghanistan and Pakistan.^[14]

This subject indicates that tuberculosis is one among the most important health priorities of the region. This subject also reveals that tuberculosis may be a regional problem and other ECO member countries should regard it as health threatening to the society; it may potentially prevail more widely in each country, as the disease may not be limited to geographical boundaries.

As it is mentioned in the introduction, TB MDG indicators are defined properly and the most recent global status is as follows. The incidence rate has been falling since 2004, the case detection rate has reached 63% in 2007, and the treatment success rate has reached 85% in 2006, but these targets will not be achieved for the world as a whole

Prevalence and mortality rates are falling globally and in all the six World Health Organization (WHO) regions. Prevalence and death rates will become half by 2015, when compared with the baseline of 1990, in the regions of the Americas, the Eastern Mediterranean, and South-East Asia, and Stop TB Partnership targets will be achieved. However, the African and European regions may not reach the prevalence and mortality targets.^[15]

Despite the current suitable status of the world, TB indicators are not the desired ones, in some countries of this region. There has been a significant increase in TB cases in newly independent countries from the ex-soviet union; some successful interventions have been taken to control TB since 2000.

Multidrug-resistant TB (MDR-TB) is one of the main urgent parts of the TB program and it is highly observed in some countries of the region. In 2008, there has been an estimated 440 000 multidrug-resistant TB (MDR-TB) cases emerging worldwide. There are 27 countries that account for 85% of all such cases. Fifty-five countries and territories have reported at least one case of extensively drug-resistant TB (XDR-TB). Only 12% of the MDR-TB cases have actually been notified globally in 2009.^[16]

One of the problems of these countries is the low case detection rate (CDR, defined as the proportion of incident cases that were notified). On the basis of the given indicators of the tuberculosis program, the least expected and estimated tuberculosis diagnosis should include 70% of the estimated cases. This number is lower than 70% in most countries. In some countries, this number is very low, about 20 to 30% of the expected cases. This low number is an indicator of the inappropriateness of tuberculosis diagnosis and facilities in these countries and the consequences thereof will be an increase in tuberculosis incidence or failure of the countries in tuberculosis control. However, many regions of the world have achieved the desirable levels for this indicator. This indicator is lower than

the expected range in the world. There were 5.8 million notified cases of TB in 2009, equivalent to a case detection rate of 63%.^[17]

There are problems about the quality of data and indicators in these countries. Most tuberculosis experts of these countries believe that the announced estimated cases for the countries are very high and they claim that the theoretical basis of these announced numbers is not reasonable.

Data gathered from the conducted surveillances in ECO countries do not have good quality. We need accurate data, to have an unbiased comparison, which is achieved by surveys. Although these surveys are expensive and laborious, they give unbiased measures of the tuberculosis burden and trends. They are also mentioned in other studies that have been conducted to define TB indicators. Most countries, where tuberculosis is highly endemic, do not yet have reliable death registration and high quality surveillance systems.^[18]

An investigation on the treatment success rate of tuberculosis in these countries reveals that, at present, the treatment success rate for smear-positive tuberculosis cases is near target (higher than 80%).

On the basis of the WHO report of 2010, of the 2.6 million patients with sputum smear-positive pulmonary TB in the 2008 cohort, 86% were successfully treated, which is more than most countries in this region.^[17]

These treatment success rates increase the hopes for the non-increment of MDR-TB. In case of accuracy, these rates may be indicators of effectiveness of the DOTS strategy for tuberculosis-diagnosed cases. Investigation of the death rate associated with tuberculosis in these countries reveals that this rate is very high in some countries in the region, and is an indicator of the high burden of tuberculosis in these countries. This high rate of death in the region due to tuberculosis is disturbing and increases the possibility of failure to achieve the defined targets in the area of tuberculosis.

Most countries of the ECO report high amount of DOTS coverage. DOTS is the best strategy for the TB control program, which affects the TB program in ECO countries. In the world, between 1995 and 2009, 49 million TB patients were treated under the DOTS / Stop TB Strategy. This saved 4.6 – 6.3 million lives. A further one million lives could be saved annually by 2015.^[19]

The target of halving the 1990 prevalence rate by 2015 appears out of reach at the global level, but could be achieved in three of the six regions: the Region of the Americas, the Eastern Mediterranean Region, and the Western Pacific Region.^[17] The ECO countries should a point that must be noted — these mixed results highlight that although MDGs focus on specific diseases and conditions, targets cannot be achieved without strengthening the health systems.

The announced tuberculosis estimated incidence rates by World Health Organization were questioned by many experts of the tuberculosis program in these counties. Most of them believed the announced annual tuberculosis prevalence rates had no reasonable theoretical basis, it was suggested that by selection and execution of an appropriate methodology, while consulting with experts of regional countries, a real and acceptable method for tuberculosis incidence rate estimation in the region's countries be prepared.

The findings indicate that, as before, tuberculosis should be considered as a priority in the health programs of these countries and should not be neglected from them. Activities that somehow increase awareness about tuberculosis in the society as a whole, and among the health care professionals and physicians should be given priority and promoted.

Important interventions are, the improvement of primary health care; implementation of an integrated package of community and primary curative and preventive care; development of district management systems; strong political leadership; coordination and harmonization across partners and government agencies; effective use of information and financial resources; participation of beneficiary communities; and intersectoral collaboration

Although DOTS coverage has been reported to be almost 100% in these countries in 2007, some measures should be taken in the area of DOTS implementation and quality. The increase of drug-resistant tuberculosis in some regional countries as well as a low rate of tuberculosis detection may be an indication of undesirable DOTS implementation.

Carrying out a survey for the purpose of investigating the quality DOTS implementation in the regions of these countries is desirable. Low TB detection rate may be a indication of

the non-implementation of DOTS as part of the primary health care system in these countries. Tuberculosis should be merged in the primary health care provided in these countries and should be implemented to cover all sections. Merging tuberculosis throughout this system, in all the countries, is one of the suggestions of this study.

On the basis of what has been stated before, tuberculosis is a great burden in the region. Holding regional meetings in the area of this disease and developing a regional cooperation in the area of this disease is useful and this study recommends providing the possibility of regional meetings in the area of this disease.

Drug-resistant tuberculosis is one of the problems of the region, which demands greater attention. In some regions of the countries, the increase in drug-resistant tuberculosis is disturbing. All activities leading to the control of drug-resistant tuberculosis are recommended. Diagnosis and treatment of MDR-TB need to be rapidly expanded. It seems that tuberculosis-susceptible groups in these countries include residents of poor districts, people with drug-resistant tuberculosis, prisoners, and people living with HIV / AIDS. Attention to these groups and implementing special programs for them is recommended.

Every year, up to a quarter of the two million HIV-related deaths are due to tuberculosis, therefore improved efforts in the joint control of tuberculosis and HIV are crucial.^[20]

Reinforcement of tuberculosis surveillance systems in these countries, for accessing exact and correct data and on-time interventions are among the other recommendations of this study. Special attention by the ECO to the two countries with the highest tuberculosis burden forms another recommendation of this study.

The MDG indicators related to tuberculosis are still below international standards in many countries in this region. Therefore, the performance was not uniform across the programs. Overall, given the multi-sectoral nature of health, it is important that relevant sectors such as water and sanitation, education, agriculture, transport, and social welfare mainstream health into their sectoral policies to assist in achieving health MDGs. This can be successfully achieved through the integration of health equity into the overarching framework of national development and poverty reduction.

There are some signs and signals indicating the bad condition of the ECO members. Iran and Turkey could achieve MDGs by 2015, but if other countries do not prepare urgent intervention programs, they will not be able to fulfill the goals.

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REFERENCES

- Small PM. Tuberculosis: A new vision for the 21st century. *Kekkaku* 2009;84:721-6.
- Kim J, Langevin M, Wylie EL, McCarthy AE. The epidemiology of tuberculosis in Ottawa, Canada, 1995-2004. *Int J Tuberc Lung Dis* 2008;12:1128-33.
- Lönnroth K, Raviglione M. Global epidemiology of tuberculosis: Prospects for control. *Semin Respir Crit Care Med* 2008;29:481-91.
- Dye C, Maher D, Weil D, Espinal M, Raviglione M. Targets for global tuberculosis control. *Int J Tuberc Lung Dis* 2006;10:460-2.
- Onozaki I, Raviglione M. Stopping tuberculosis in the 21st century: Goals and strategies. *Respirology* 2010;15:32-43.
- Burzynski J, Schluger NW. The epidemiology of tuberculosis in the United States. *Semin Respir Crit Care Med* 2008;29:492-8.
- Harries AD, Dye C. Tuberculosis. *Ann Trop Med Parasitol* 2006;100:415-31.
- Dye C, Watt CJ, Bleed DM, Hosseini SM, Raviglione MC. Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence, and deaths globally. *JAMA* 2005;293:2767-75.
- Dye C, Hosseini M, Watt C. Did we reach the 2005 targets for tuberculosis control? *Bull World Health Organ* 2007;85:364-9.
- Jittimanee S, Vorasingha J, Madasin W, Nateniyom S, Rienthong S, Varma JK. Tuberculosis in Thailand: Epidemiology and program performance, 2001-2005. *Int J Infect Dis* 2009;13:436-42.
- Onyango RO. State of the globe: Tracking tuberculosis is the test of time. *J Global Infect Dis* 2011;3:1-3. Available from: <http://www.jgid.org/text.asp> [Last accessed on 2011 Mar 01].
- Glaziou P, Floyd K, Raviglione M. Global burden and epidemiology of tuberculosis. *Clin Chest Med* 2009;30:621-36, vii.
- Malek AH, Holakouei NK, Rashidian A, Vazirian P, Moradi G, Mirzazadeh A, *et al.* Tracking the maternal mortality in economic cooperation countries; achievement and gaps toward millennium development goals. *J Fam Reprod Health* 2010;4:9-14.
- WHO. Global tuberculosis control: Surveillance, planning, financing: WHO report 2008. Geneva, Switzerland: World Health Organization; 2008.
- WHO, Global tuberculosis control, epidemiology, strategy, financing, WHO Report 2009, Geneva, Switzerland: World Health Organization; 2009.
- WHO, Global Tuberculosis Control. WHO Report 2010 Summary. *Cent Eur J Public Health* 2010;18:237.
- WHO, Global tuberculosis control 2010, WHO Report 2010, Geneva, Switzerland: World Health Organization; 2010.
- Dye C, Bassili A, Bierrenbach AL, Broekmans JF, Chadha VK, Glaziou P, *et al.* Measuring tuberculosis burden, trends, and the impact of control programmes. *Lancet Infect Dis* 2008;8:233-43.
- Glaziou P, Floyd K, Korenromp EL, Sismanidis C, Bierrenbach AL, Williams BG, *et al.* Lives saved by tuberculosis control and prospects for achieving the 2015 global target for reducing tuberculosis mortality. *Bull World Health Organ* 2011;89:573-82.
- Atun R, Raviglione M, Marais B, Zumla A. Tuberculosis control is crucial to achieve the MDGs. *Lancet* 2010;376:940.

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