Effects of the Health Transformation Programme on tuberculosis burden in Turkey

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Summary
Objective: The Fifty-ninth Turkish Government announced an emergency action plan and embarked on a comprehensive health reform named “Health Transformation Program” (HTP) in 2003. This study investigated the effects of HTP on tuberculosis (TB) burden from 2003 to 2010 in Turkey.

Design: TB incidence, prevalence, mortality and case detection rates, treatment success and direct observed treatment strategy (DOTS) applications rate, and contribution of these applications in the success of the TB war were retrospectively investigated.

Results: The annual decrease of incidence rate was 2.86 between 1995 and 2002, and 1.22 between 2003 and 2010 (√p<0.05). The decrease of prevalence rate was 2.88 between 1995 and 2002 and 1.25 between 2003 and 2010 (√p<0.05). The annual declines in mortality were 0.44 between 1995 and 2002 and 0.22 between 2003 and 2010 (√p<0.005). The DOTS application rate increased from 0% in 2003 to 98% in 2010. After the HTP treatment success rate of TB at 85% of Turkey was firstly reached to 89% in 2005 and increased to 91% in 2007. Case detection rate of new pulmonary TB patients was 82% in 2005 and 81% in 2008 reaching the WHO target for the first time with HTP.

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Introduction

One third of the world’s population is infected by Mycobacterium Tuberculosis (TB). According to the WHO Global Tuberculosis Control report of 2011, 8.8 million each year (range, 8.5 to 9.2 million) suffer from TB. Approximately 1.1 million of these patients (range, 0.9 to 1.2 million), and 0.35 million (range, 0.32 to 0.39 million) patients with acquired immune deficiency syndrome would die due to TB infection [1]. Turkey’s Ministry of Health reported a total of 17,400 registered patients in Turkey in 2009 [2].

Turkey experienced a serious TB epidemic at the beginning of this century. TB was the leading cause of death. This situation continued until the 1950s. The death rate due to TB was around 200–250/100,000 in those years [3,4]. Therefore, the fight against TB was begun in the first years of the Republic of Turkey and is still continuing. TB control has continued under the control and coordination of this institution in collaboration with national and international institutions [5]. Directly observed therapy strategy (DOTS) implementation gained further momentum with the extension of the program and started to get successful results. In 1991, WHO defined the targets of 70% detection of sputum-smear positive cases and 85% treatment success rate of these cases as an indicator of a successful TB control programme. These targets were adopted and Stop TB Strategy was implemented. Subsequently, the target parameters were further increased in the 2000s [6–9]. The goals of the strategy are for prevalence and death rates to be reduced by 50% relative to 1990 levels by 2015 and for TB eradication all over the world by 2050 [8]. Turkey adopted this strategy and is among 36 countries that have reached this goal in recent years [5].

The Fifty-ninth Turkish Government announced an emergency action plan and embarked on a comprehensive reform of public health in 2003. This reform involved serious changes in health services with a slogan "health for everybody". The main objectives of this program are the maintenance of public health and, prevention of illness, and thus improve the health status of the people and reorganize the health sector in Turkey. With regard to the planning and delivery of these services, priority has been given to prevention, Primary Health Care services has been strengthened and attention has been focused onto issues like the proper functioning of public health services and the efficient control of epidemic diseases [10].

After the implementation of the Health Transformation Program (HTP), the most important advances in the tuberculosis fight, performed under the patronage of tuberculosis control department (TCD), were achieved by the expansion of DOTS which is one of the main parts of HTP. TCD is an institution affiliated with the ministry of health. Responsibilities include the development of effective plans, programs and policies relevant to the tuberculosis war, taking all necessary measures to protect against the spread of TB and to ensure the control and treatment of TB, as well as education of patients, individuals and communities about TB, and performing other responsibilities as assigned by the Ministry of Health.

This study aimed to investigate the effect of HTP on TB prevalence, incidence and mortality, case detection and treatment success rate in Turkey.

Method

Data collection

The data was obtained from TCD [2]. There were 198 active TB dispensaries (TD) connected to TCD throughout Turkey in 2010. Reporting of TB cases is mandatory in Turkey. All TB cases diagnosed in private and public hospitals had to report to the TB dispensaries to received TB drugs and for contact examination. The surveillance system is based on TB cases. Confirmed TB cases and contact examinations have been carefully investigated by TB dispensaries. The reporting of TB cases to TCD is undertaken by Local Health Offices through filling in and sending of the standard forms online to Ministry of Health. TCD officers analyse and process the data and send them back to peripheral offices for their records. These data are present in information system of the Ministry of Health, as well.

These records were collected annually by the National TB Surveillance Research organization. We analysed these data and the study was approved by the Ministry of Health.

The success criteria

The targets established by WHO for TB control were used as criteria for measuring the success of TB treatment and the overall success of the fight against TB in Turkey during theperiod of investigation [11]. TB incidence, prevalence, mortality, case detection rate, treatment success, and DOTS applications rate were studied and their overall effects of the TB war were determined. During the implementation of HTP, Stop TB Strategy was created under the leadership of the WHO in 2006. Furthermore, the progresses made toward achieving the aims of the Stop TB Strategy were evaluated. Finally, the activities and changes in the budget of TCD following the implementation of HTP as well as innovations in the TB control program of this period were investigated.

Conclusion: A trend of reduced TB burden began in Turkey in 1997. As a result of the implementation of HTP beginning in 2003, the target treatment success and DOTS application rates were achieved and progress has continued even in the face of the recent worldwide economic crisis.

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Figure 1  A. The rates of TB incidence (A), TB prevalence (B) and TB death (C) between 1990 and 2010 have been significantly decreased since 1997.
A  TB incidence rate Turkey and WHO European region

B  TB prevalence rate Turkey and WHO European region

C  Case detection rate of new smear-positive pulmonary TB cases between 2002 and 2008
Statistics

Regression analysis was used to determine yearly changes in investigated parameters. Pearson correlation analysis was used to determine whether a relationship exists between the budget of TCD and the incidence, prevalence and mortality rates. A p-value of <0.05 was accepted as the level of significance and SPSS 15.0 statistical analysis software was used.

Results

Incidence, prevalence and mortality rates

As shown in Fig. 1A and B, the rates of TB incidence and prevalence in Turkey have declined for many years. Between 1997 and 2003 the incidence rate has decreased from 58/100,000 to 37/100,000. After 2003, it was decreased from 37/100,000 to 28/100,000. The average annual decrease was 2.86 between 1999 and 2002, and 1.22 between 2003 and 2010 (p < 0.05). Similar changes were observed in prevalence. The amount of decreases in the average annual prevalence rate were 2.88 between 1995 and 2002 and 1.25 between 2003 and 2010 (p < 0.05). TB mortality has decreased from 9/100,000 in 1995 to 5/100,000 in 2003, and it decreased from 5/100,000 in 2003 to 3/100,000 in 2010. The annual declines in mortality were 0.44 between 1995 and 2002 and 0.22 between 2003 and 2010 (p < 0.005).

Stop-TB targets (the reduction of TB prevalence and deaths by 50% by 2015, in comparison with a 1990 baseline): Turkey’s position

While the TB prevalence rate in Turkey was 52/100,000 in 1990, it was reduced to 26/100,000 in 2006 and 24/100,000 in 2010. The target of reducing TB prevalence by half of the 1990 rate was, therefore, achieved in 2006 in Turkey after the HTP.

Also, HTP application caused a reduction in the TB mortality rate from 7.1/100,000 in 2002 to 3.3/100,000 in 2006 and 3/100,000 in 2010. Turkey reached the target prevalence rate in 2006.

Detection of new smear-positive pulmonary TB cases

The correct data related to detection of new smear-positive pulmonary TB cases and the treatment of smear-positive TB patients began to be obtained in 2002. Therefore, we cannot perform a comparison between pre- and post- HTP period. The target of WHO is detection of at least 70% of new smear-positive pulmonary TB patients using bacteriological examination. In Turkey, in 2005 bacteriological diagnosis was made in 82% of the new pulmonary TB patients, reaching this target for the first time with HTP. In 2008, this rate was 81%. As shown in Fig. 2C, this achievement has continued to the present. After 2008, WHO abandoned this metric and, thus, it is not calculated in subsequent years.

The treatment of smear-positive TB patients

Following the HTP application the success rate TB treatment at 85% of Turkey was firstly reached to 89% in 2005 and increased to 91% in 2007. Turkey maintains the success on the new smear-positive pulmonary TB patients.

DOTS practices in Turkey

The application of DOTS in Turkey was started as a pilot in four tuberculosis dispensaries in 2003 with HTP, and was extended throughout the rest of the country in June 2006. The application of DOTS was 50.9% in the second half of 2006, and by 2009 had gradually increased to 96.6%. The DOTS application rate increased from 0% in 2003 to 98% in 2010.

Budget of TCD

The budget of TCD has been increasing over the years, as shown in Table 1. The budget for 2002 was 31,726,007 TL and this figure increased by 58% to 53,440,922 TL in 2010.

As shown in Fig. 3A, B and C, we found highly statistically significant negative correlations between budget figures and TB incidence, TB prevalence and TB mortality rates. By increasing the amount of budget, TB incidence (r = -0.97, p < 0.0001), TB prevalence (r = -0.98, p < 0.0001) and TB mortality (r = -0.97, p < 0.0001) rates have decreased.

The share of DOTS within the TCD budget is depicted in Table 2. Wholesale large amounts of drugs were purchased in the first year of DOTS application in 2006. After that, DOTS expenditures were changed in subsequent years.

Discussion

This study showed that Turkey has achieved the Stop-TB target (the reduction of TB prevalence and deaths by 50% by 2015, in comparison with a 1990 baseline) after HTP application. Also, following years of the HTP application, the WHO’s target of the detection of new smear-positive pulmonary TB cases at 70%, and the treatment of smear-positive TB patients at 85% were achieved in 2005. DOTS application was first begun in 2006 and the budget of TCD has increased by 58% after HTP.

TB incidence has been decreased since 1997. This decrement has been ongoing since 2003 when application of the HTP was started. The incidence rate remained nearly stationary between 2005 and 2006. The reason for this increase cannot be fully explained; however, it may be related to several factors, including an increase of contact examinations, increased notification of TB patients and an increase in diagnosis with improvement of health care institutions. We suggest that the TB patient number is related to several factors, including an increase of contact examinations, increased notification of TB patients and an increase in diagnosis with improvement of health care institutions.

Figure 2  TB Incidence (A) and point TB prevalence (B) rates in Turkey were significantly lower than the WHO European Region between 2002 and 2010. (B) Case detection of new smear-positive pulmonary TB cases depicted between 2002 and 2008. (After 2008 WHO abandoned this calculation).
the budget figures, activities of TCD, political stability, and improvement in the quality of health services. Most importantly, it should be mentioned that the role of DOTS treatment was expanded during this period throughout almost all of Turkey. In addition, improvement of the general health status in Turkey and increasing the number of working health personnel are other parameters which play a role in this success [12, 13].

On the other hand, the ability of tuberculosis patients to reach physicians was facilitated by HTP. Patients without social security benefited from health services using social assistance and other state funds. After the application of HTP, the social security systems were combined and a Social Security Administration was created, therefore facilitating access to all health service providers. With this assurance, the patient can access both private and state health care facilities. After the combination of social insurance (SSK) hospitals and public hospitals, patients had access to a wider range of health care facilities and this enabled previously undetected TB patients to be registered. Some TB patients that previously went undetected due to limited access to health care facilities were registered under the new system, thereby increasing the apparent number of TB cases in Turkey [12, 13].

Despite the fact that, globally, TB control programs have achieved some degree of success, the desired level of achievement has not been reached, especially in Africa and Asia. The main reasons for the lack of success of National TB control programs are considered to be: inadequate health care systems, economic failure and weak infrastructure facilities, all of which result in a lack of diagnosis and treatment of TB [14, 15]. The main reason that countries with high rates of TB deaths are unable to achieve the WHO’s targets is insufficient funding. Although the money allocated would be doubled between 2002 and 2009 for the control of TB in these countries, it is still an insufficient amount [16]. The reasons behind the success of TB control in Turkey are economic stability, governmental stability and the gradual increase in money spent on the control of tuberculosis in last decade. This increases in TB budget resulted in the decrease of TB incidence, prevalence and death rate in an almost one to one ratio ($r = -0.97$), (Fig. 3). This increase in the budget became more prominent after the implementation of the HTP.

The Chinese government has activated a tuberculosis control program by using funding from the World Bank of $58.2 million. While only 32% of TB cases could be diagnosed in the 1990s, with the implementation of a strong TB control program, 80% of cases were diagnosed in 2005. This program also emphasizes the importance of the need to strengthen the public health system [17].

In a previous study determined what factors contribute to differences in TB incidence rates among Chile, Colombia, Bolivia and Peru. They proposed that comprehensive implementation of the DOTS is the main factor explaining the lower TB incidence rates in Colombia and Chile, even after considering socio-economic factors [18]. Likewise, in Turkey, DOTS have been implemented with success and good results have been obtained.

Recently the HIV epidemic, especially in African countries, caused increases in TB incidence to the point of an epidemic [19–22]. Thus, WHO needed development of national TB control programs in these areas. Up to the end of 1997, national TB control programs in Zambia were not successful. Later on in this country, health care reformers and anti-tuberculosis activists began cooperating and implemented an effective TB control program. Therefore correct TB diagnosis and treatment was possible and hope rose for TB combat [23]. A similar example in Sudan has been experienced. After the implementation of a TB control program, the correct TB diagnosis rate increased from 16% in 1994 to 63% in 1996. And treatment success rate were increased from 62% to 73% [24]. Owing to the DOTS, these countries have overcome seemingly insurmountable obstacles, and become a beacon of hope for the region. The treatment success rate has increased, and mortality and resistance development rates were decreased in many countries where DOTS has been applied [25–28]. As mentioned above, the program has been applied in 98% of our country.

The unpublished data obtained from Turkish Ministry of Health revealed that there are 5224 HIV+ persons in Turkey. Routine HIV testing in patients with TB was not performed in Turkey until 2011. A circular was published by Ministry of Health to conduct HIV testing of TB patients in 2011 and found 21 TB patients who were also HIV positive in this year. This initial data suggests that the association between HIV and TB has not yet reached an important level.

One of the most important components of a healthcare system is to improve health and to use the available funding and resources in the most efficient way. Regardless of how it was done, there are 6 basic components to achieving this purpose: leadership/governance, health financing, health service delivery, health work force, medical product/technologies and health knowledge [29, 30]. As mentioned above, recently the tuberculosis fight in Turkey is based on the Stop-TB Strategy guided by WHO. One of the six components of the Stop-TB strategy is a fixed/reformed health system. It is clear that an effective and sustainable tuberculosis control program is based on a strong public health system. Such a system includes the strengthening of a national network of TB laboratories, the development of a drug distribution system, efficient use of human labour and

| Table 1: The changes of budget of TB Control Department by years. |
|-------------------------|---------------------|
| **Years**               | **Budget of TB Control Department (TL)** |
| 1996                    | 1,714,345           |
| 1997                    | 3,907,172           |
| 1998                    | 6,883,919           |
| 1999                    | 11,397,131          |
| 2000                    | 15,232,604          |
| 2001                    | 21,227,451          |
| 2002                    | 31,726,007          |
| 2003                    | 37,830,924          |
| 2004                    | 48,494,016          |
| 2005                    | 52,211,874          |
| 2006                    | 55,715,120          |
| 2007                    | 52,979,439          |
| 2008                    | 50,192,726          |
| 2009                    | 53,483,757          |
| 2010                    | 53,440,922          |
the strengthening of primary health care as in the family medicine system [29,30]. HTP mostly includes these proposed suggestions to improve health and the TB fight in Turkey.

As shown in Fig. 2A and B, comparing the point prevalence and incidence rates in Turkey and the WHO European region, the values for Turkey are markedly lower than that of the WHO European region. Fig. 2B clearly shows that, in particular, the point prevalence rate in Turkey is significantly lower than that of the WHO European Region. The observed decrease in the point prevalence rate of the WHO European region was $-0.3\%$ per year whereas it was $-1.82\%$ per year in Turkey. The prevalence rate in Turkey decreased from 51/100,000 in 1990 to 26/100,000 in

![The negative correlation between TB incidence and budget of TCD](image1)

![The negative correlation between TB prevalence and budget of TCD](image2)

![The negative correlation between TB mortality and budget of TCD](image3)

Figure 3 A scatter graph for the budget of TCD and TB incidence (A), TB prevalence (B) and TB mortality rates (C). There are a statistically significant negative correlations between budget figures and TB incidence ($r = -0.97, p < 0.0001$), TB prevalence ($r = -0.98, p < 0.0001$) and TB mortality ($r = -0.97, p < 0.0001$).
TB control resulted in an increase in success [31]. Similar Bangladesh, combining of non-governmental organizations, reduction.

WHO Stop TB Strategy 2015 targeted prevalence rate 2006. Therefore, in 2006 Turkey had already achieved the 2015 targets of the Stop-TB strategy were achieved by 2006 and the achieved successes are attributed to the success of our tuberculosis control program. In conclusion, the prevalence, incidence and mortality rates of TB have been decreasing in Turkey for decades. As can be seen in an application performed in Bangladesh, combining of non-governmental organizations, the private sector and government forces in the struggle for TB control resulted in an increase in success [31]. Similar results were obtained in a previous practice in Kenya [32]. In this regard, it was concluded that inclusion of family physicians in the implementation of DOTS treatment was the right decision in Turkey.

TB drugs given free of charge is very important for the success of a good TB control program. Recently a study was conducted with funds provided by the government in the Batibo region in Cameroon, where TB patients were treated in a hospital. In this study, the DOTS conducted and the drugs were distributed free of charge. They found that the success of treatment, and diagnosis rates increased and death rates significantly decreased [33]. Similar changes were observed in our country.

The Turkish example and other successful countries such as Cameroon and Kenya has suggested that the worldwide control of TB can be achieved by increases of TB budgets, governmental stability, proper treatment of TB cases by DOTS, and increased research funding for development new drugs and quick diagnostic methods.

The limitations of the study lie in the retrospective nature of the work, the absence of some data such as detection of new smear-positive pulmonary TB cases and treatment success rate of smear positive pulmonary TB patients before 2002. Therefore, we cannot compare these data between pre and post HTP period. Additional studies are needed to investigate the long term effect of the HTP programme.

In conclusion, the prevalence, incidence and mortality rates of TB have been decreasing in Turkey for decades. HTP associated with the economic stabilization program of Turkey have been continuing this achieved success when dealing with the economic crisis in many countries. We also suggest that the improvement in our registry system, expansion of DOTS, strengthening of the laboratory network, providing free TB drugs, increases in TCD budget, restructuring of tuberculosis dispensaries, and strengthening international TB control efforts globally has contributed to the success of our tuberculosis control program. In this way, the 2015 targets of the Stop-TB strategy were achieved by 2006 and the achieved successes are continuing. Obtained achievements give hope that Turkey’s efforts will eliminate TB in future years. Additional studies are needed to investigate the long term effect of the HTP programme.

### Table 2 DOTS expenditure within the TCD budget.

<table>
<thead>
<tr>
<th>Years</th>
<th>First-line drug expenses (TL)</th>
<th>Second-line drug expenses (TL)</th>
<th>Routine program management (TL)</th>
<th>Total (TL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>5,098,325.00</td>
<td>978,977.84</td>
<td>-</td>
<td>6,077,303.36</td>
</tr>
<tr>
<td>2007</td>
<td>2,638,226.78</td>
<td>Not buying drugs</td>
<td>629,618.19</td>
<td>3,267,844.97</td>
</tr>
<tr>
<td>2008</td>
<td>Not buying drugs</td>
<td>45,355.51</td>
<td>-</td>
<td>45,355.51</td>
</tr>
<tr>
<td>2009</td>
<td>1,806,810.00</td>
<td>1,325,960.00</td>
<td>537,990.00</td>
<td>3,670,760.00</td>
</tr>
<tr>
<td>2010</td>
<td>1,351,182.60</td>
<td>950,370.84</td>
<td>20,197.20</td>
<td>2,321,749.83</td>
</tr>
</tbody>
</table>

2006. Therefore, in 2006 Turkey had already achieved the WHO Stop TB Strategy 2015 targeted prevalence rate reduction.

As can be seen in an application performed in Bangladesh, combining of non-governmental organizations, the private sector and government forces in the struggle for TB control resulted in an increase in success [31]. Similar results were obtained in a previous practice in Kenya [32]. In this regard, it was concluded that inclusion of family physicians in the implementation of DOTS treatment was the right decision in Turkey.

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### Conflict of interest

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