Trend of application of World Health Organization control strategy of tuberculosis in Egypt

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Abstract World Health Organization (WHO) control policy for tuberculosis (TB) includes Bacillus Calmette-Guérin (BCG) vaccine at birth, case detection, and treatment of cases with directly observed therapy short-course (DOTS). This policy has been applied through the Ministry of Health and Population in Egypt for more than 30 years. The controversies about the efficacy of the BCG vaccination against TB in adults initiate some suggestions for its discontinuation from compulsory vaccinations in countries with low incidence of TB. The present work aimed to study the trend of applying the WHO control policy for TB in Egypt among the Egyptian population throughout the last 20 years (1992–2011). The documented database of the country, bibliographic review on MEDLINE, published studies and reports, WHO and EMRO databases that covered the period from 1992 to 2011 were used in this study. The incidence rate of all forms of TB (pulmonary and extrapulmonary) dropped by 50% from 34 cases to 17 cases per 100,000 population, as well as the prevalence rate declined by 60.6% from 71 cases per 100,000 population throughout the last 20 years. Case detection and treatment success rates have increased throughout the studied period while it flat-lined over the past 6 years which may need attention. The results of this study introduce an evidence-based recommendation for continuation of the WHO TB control policy in Egypt towards elimination of the disease.

1. Introduction

Tuberculosis (TB) remains a major global health problem. It ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus (HIV). The latest estimates by the World Health Organization (WHO) reported that there were 9 million new cases in 2011 and 1.4 million TB deaths [1]. Moreover, it is one of the top 10 causes of global mortality and

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affects low-income countries in particular. About half a million children (0–14 years old) are ill with TB, and 64,000 children died from the disease in 2011 [2]. In Egypt, TB is considered the third most important public health problem after schistosomiasis and hepatitis C [3,23]. The objectives of WHO in TB control policy are to reduce mortality, prevalence and incidence of TB. The basis of this policy for TB control depends on early case detection, proper treatment of cases with directly observed therapy short-course (DOTS), in addition to the compulsory BCG vaccination [4,5]. In 1996, the National TB program of Egypt took action to tackle low adherence of patients to TB treatment and began implementation of the DOTS program [6]. This action improved the average rate of defaulting in Egypt in 2008 to 4% [7]. Clinical trials have demonstrated conflicting results regarding BCG vaccine efficacy. Meta-analytic reviews have estimated the vaccine efficacy in preventing any type of TB at approximately 51% [8]. The protective effect of BCG vaccine against disseminated TB in the newborn is estimated to be 78%. Although generally the duration of the BCG vaccine protection is not well-established, one follow-up study demonstrated a protective effect for up to 60 years [9]. The International Union against Tuberculosis and Lung Disease suggested that routine BCG vaccination should be discontinued when the notification rate of pulmonary TB reaches less than 5 per 100,000 population per year [10]. One of the targets of the United Nations millennium development goals, by 2015, is to halt the mortality and morbidity indicators of TB, improving the case detection rate to reach 70% and treatment success rate to reach 85%. The present study aimed to present the trend of the application of the WHO TB control policy in Egypt throughout the last 20 years (1992–2011).

2. Methodology

2.1. Collection of data

1. Data about immunization coverage rates of the compulsory BCG vaccination for Egyptian children, under 5 years old mortality rates due to TB, morbidity and mortality rates of TB of all forms in all age groups, case detection and treatment success rates of TB were used in the present study.
2. Sources of data: Bibliographic review on MEDLINE, published studies and reports, and WHO and EMRO online databases that covered the period from 1992 to 2011 [11,12].

3. The data were revised and filtered according to documentation; all non-documented data were excluded from the final statistical analysis.

2.2. Statistical analysis of the collected data

Statistical models are used to identify the time trend of the above-mentioned predictor variables of TB. Pearson correlation coefficient and linear regression models were used to study the relationships between the predictor variables (e.g., the BCG immunization coverage, case detection rate and treatment success rate) and the outcome of interest (e.g., morbidity and mortality rates of TB) using SPSS version 18.0. The significance level was considered at P-value <0.05.

3. Results

Statistical analysis of the collected data revealed that there was a high statistically significant increase in the coverage rate of compulsory BCG vaccination during the last 20 years ($r = 0.7$, $P = 0.001$). This increase was in two steps from 92% to 95% between the years 1992 and 1993, and the second step was between the years 1996 and 1997 from 95% to 98% with few exceptions as shown in Fig. 1. In 1998 and in 2006, there was an increase in the coverage rate reaching 99%.

The TB case detection and treatment success rates were increasing throughout the duration (1992–2011) with a fluctuating trend from progression to regression and so on with a plateau over the past 5 years (Figs. 2 and 3, respectively).

Moreover, severe declines were observed in the trend of the TB mortality rate per 100,000 population as well as in the under 5 years old TB mortality rate per 1000 live births during the period 1992–2011 (Figs. 4 and 5, respectively), as there were significant inverse correlations between the time in years and the rates of TB mortality and under 5 years old mortality ($r = -0.85$, $P < 0.0001$ and $r = -0.99$, $P < 0.0001$, respectively).

Statistically significant inverse correlations were also detected between the time in years and the TB morbidity rates per 100,000 population (incidence and prevalence rates; $r = -0.99$, $P < 0.0001$, and $r = -0.94$, $P < 0.0001$, respectively) (Fig. 6).

There were significant inverse correlations between the BCG vaccination coverage rate and the rates of TB morbidity and mortality, and under 5 years old mortality (Table 1). There were also significant inverse correlations between the rates of