Impact of mobile teams on tuberculosis treatment outcomes, Riyadh Region, Kingdom of Saudi Arabia, 2013–2015

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ABSTRACT

The objective of this study was to evaluate the impact of the tuberculosis (TB) mobile teams on treatment outcomes in Riyadh Region by comparing patients who received treatment under mobile teams and those who did not, from 2013 to 2015. This was a retrospective descriptive study using National TB Control and Prevention Program data from 2013 to 2015 from Riyadh, Kingdom of Saudi Arabia. Descriptive analyses were used to summarize characteristics of TB case-patients served by mobile teams and those who were not served. The χ^2 test measured the significant differences between mobile-served and non-mobile-served case-patients. Exposure was whether or not the TB case-patient was under the care of the mobile team; the outcome of interest was whether or not treatment was successful, defined as treatment completed and cured. We found that the ratio of treatment success among mobile team case-patients was 1.28 greater than among those not served by mobile teams. The χ^2 test showed a statistically significant finding (probability ratio = 1.28; 95% confidence interval = 1.21–1.35, $p < 0.01$). Mobile teams increased the treatment success rate to 92%, compared to 71.77% among those not served by mobile teams. This study shows that community mobilization of mobile teams is an effective strategy to enhance TB treatment, reduced mortality and loss to follow-up and improve TB treatment outcomes.

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1. Introduction

Despite improvement in diagnosis, treatment, and prevention of tuberculosis (TB), it remains a significant public health concern globally and is considered a re-emerging infectious disease. The 2016 Global Tuberculosis Report showed that almost one-third of the global population was infected with TB, with around 10.4 million new cases. There were 480,000 new cases of multi-drug resistant TB (MDRTB) and an additional 100,000 new cases with rifampicin-resistant TB. There were 1.4 million deaths resulting from TB and an additional 400,000 TB-related deaths among people living with human immunodeficiency virus (HIV). Unfortunately, from 2014 to 2015, the drop in TB incidence was only 1.5% globally [1].

One of the targets of the Sustainable Development Goals for 2030, implemented by the United Nations in 2015, is to end the global TB epidemic. The World Health Assembly, in 2014, approved the World Health Organization (WHO) End TB Strategy (2014), which demands by 2030, a 90% reduction in TB deaths; an 80% reduction in the TB incidence rate (as compared with 2015); and that no TB-affected household faces catastrophic costs [1]. To meet the first milestones of the End TB Strategy, huge efforts are needed to fast track the decline in incidence to a 4–5% annual decline by 2020 [1].

Such efforts are needed in the Kingdom of Saudi Arabia (KSA), which is the third largest country in terms of land area in the Middle East, representing the vast majority of the Arabian Peninsula [2], and is a low-to-middle TB burden country according 2015 reports by the WHO, with an incidence rate of 12 per 100,000 [3]. According to the KSA Ministry of Health (MoH) statistics, overall TB incidence showed an uprising trend from 1992 onwards, with a peak in 1999 (12.2 cases per 100,000 population), which then started to drop only slightly [4]. The total number of new cases of pulmonary TB in 2015 was 2505, with an incidence rate of 7.95 cases per 100,000 population. The total number of cases of nonpulmonary TB reached 841, with an incidence rate of 2.67 per 100,000 population [5]. KSA has experienced vast economic expansion that has resulted in improvement of social and health services. This has led to an influx of large numbers of foreign

workers (currently there are 12,185,284 non-Saudi nationals [6]), which is a potential population health risk for KSA, given that international travel, immigration, and movement of populations can facilitate the spread of TB [7]. In fact, 56% of reported TB cases have been found among non-Saudis, in comparison to 44% for Saudi nationals [5].

The KSA MoH implemented a National TB Control and Prevention Program (NTCPP) that worked for >30 years in response to the world plan to eliminate TB [8]. Based on the WHO End TB Strategy, the NTCPP has developed ambitious targets: to raise the cure rate of smear-positive TB to >85%; to detect >70% of the estimated TB cases; and to decrease the incidence rate of pulmonary smear-positive TB in the country to 1 per 100,000 population. Also, NTCPP adopted the Directly Observed Therapy short course (DOTs) program in 1999, which is the standard WHO TB treatment strategy. After many years of dealing with different TB treatment method, DOTs strategy has emerged as the best solution to many problems, especially nonadherence, and has been proven effective in several parts of the world. DOTs strategy reduced the treatment failure rate from 17.6% to 6.2% in a large Chinese study [9]. Furthermore, primary and acquired TB drug resistance have been found to reduce as a result of DOTs strategy implementation, from 13% and 14% to 6.7% and 2.1%, respectively, according to Weis et al. [10]. Moreover, in the long run, DOTs strategy is considered to be more cost-effective in comparison with other TB treatment and control methods [11].

Due to the efforts of NTCPP in 2015, TB treatment coverage was 87%. However, the treatment success rate of new and relapsed cases was 62%, which remains below the international target set by the WHO (85%) [1]. Nonadherence and drug interruption are major barriers towards TB control in KSA [12]. Research shows that the most important aspect in TB treatment success is patient adherence with the prescribed drugs. It is unclear whether the patients take the prescribed medication even if they visit clinics regularly. As a result of noncompliance and drug interactions, drug resistance and relapse occur [13]. However, improved control efforts and widespread implementation of DOTs by NTCPP has not led to the expected fall in TB trends [14]. In response to this, NTCPP has added mobile teams in Riyadh and Jizan cities, aiming to decrease the default rates and improve patient outcomes through community outreach. This addition is expected to lower the incidence of the disease. Therefore, based on such results, the expansion of mobile teams to cover the whole country is currently under consideration by NTCPP [15,16].

In Riyadh City, which was the focus of the present study, there are currently 20 mobile teams distributed according to population density. Every mobile team is fully equipped and consists of a physician, nurse, heath inspector, and driver. The main objective of the mobile team is to ensure adherence to all aspects of the DOTs therapy strategy when treating TB patients in a holistic care approach. Mobile teams focus on treatment and sputum follow-up of the positive cases at 2 months, 4 months, and 6 months (treatment monitoring) in addition to contact tracing. They also play an important role regarding the diagnosis of TB suspects in their facilities and the nearby ones (in their area), and send the samples to the laboratory for confirmation. Furthermore, they visit the private hospitals in their area looking for suspect cases. Every TB patient is eligible to receive service by mobile teams except for those patients who require hospitalization [16].

The aim of this study was to evaluate the impact of the TB Mobile Teams on TB treatment outcomes in Riyadh Region by comparing patients who received treatment by mobile teams and those who did not, from 2013 to 2015. The findings will help NTCPP in the decision on whether to expand mobile teams to cover the whole country to help with TB control and move forward towards elimination of the disease.

2. Materials and methods

2.1. Data source

TB is one of many notifiable diseases in KSA. According to the MoH Department of Infectious Diseases, healthcare facilities should report new TB cases monthly to NTCPP [17]. These reports include demographic, clinical, and epidemiological data. NTCPP then publishes the data after deep analysis via the Annual Statistical Health Report [5].

2.2. Study design

This was a retrospective study using the NTCPP data from 2013 to 2015. Mobile TB teams have been implemented in two cities only (Riyadh and Jizan) [16]. Riyadh is the capital, with the highest population density (6.195 million) [18] and therefore this study used NTCPP data from Riyadh to compare TB case-patients served by mobile teams and those not served. The study started in August 2016 and ended in March 2017.

2.3. Study variables

There were 10 variables included in the study: (1) year (3 subvariables: 2013, 2014, and 2015); (2) team (2 subvariables: mobile and nonmobile); (3) age (continuous variable); (4) sex (2 subvariables: male and female); (5) nationality (2 subvariables: Saudi and non-Saudi); (6) patient type (2 subvariables: new and relapse); (7) TB site of infection (3 subvariables: pulmonary, extrapulmonary, and both); (8) acid-fast bacillus (AFB) test result (3 subvariables: positive, negative, and not done); (9) HIV test result (3 subvariables: positive, negative, and not done); and (10) treatment outcome (6 subvariables: complete treatment, cured, failed, died, not evaluated yet, and lost to follow-up)

2.4. Ethics

This study was based on secondary data without any personal identifiers; it did not meet the category of human subject research and was reviewed by Emory University Institutional Review Board.

2.5. Statistical analyses

Descriptive analyses were used to summarize characteristics of TB case-patients served by mobile teams and those not served. χ^2 tests measured the significant differences between mobile and nonmobile groups. Exposure was whether or not the TB case-patient was served by the mobile team; the outcome was whether or not treatment was successful. According to the United Nations [19] developmental goals, "treatment success rates are calculated from the data as the proportion of new smear-positive TB cases registered under DOTS in a given year that successfully completed treatment, whether with ('cured') or without ('treatment completed') bacteriologic evidence of success" [19]. SAS (SAS Institute Inc., Cary, NC, USA) was the platform used to perform all analyses. All p values were two-tailed. A p value <0.05 was considered significant. Rates were compared using probability of success ratios and 95% confidence intervals.

3. Results

From 2013 to 2015, there were 1600 TB patients in Riyadh Region registered in the NTCPP database with treatment outcomes recorded (Table 1). Nine hundred and thirty-four (58.38%) patients were served by mobile teams, while 666 (41.63%) were not served.