



Contents lists available at ScienceDirect

The Social Science Journal

journal homepage: www.elsevier.com/locate/soscij



Economic burden of tuberculosis and its coping mechanism at the household level in Pakistan

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ARTICLE INFO

Article history:

Received 21 May 2017
Received in revised form
16 December 2017
Accepted 6 January 2018
Available online xxx

Keywords:

Economic burden
Socio-economic factors
Catastrophic health expenditures
Patients
Coping mechanisms
Tuberculosis
Pakistan

ABSTRACT

Despite the availability of free medicines under the Directly Observed Treatment Short-course (DOTS) strategy, the treatment of tuberculosis (TB) still involves high costs that push people into poverty. This study aims to assess the resulting economic burden of TB and examine the coping mechanisms practiced at the household level in Pakistan. A cross-sectional study was conducted at TB centers by interviewing 269 patients. Statistical tests and binary logistic regression were used to explore the relationship between catastrophic health expenditures (CHE) and socio-economic factors. Results show that the incidence and intensity of CHE were higher for households in the lower income-quintile. Several coping strategies were practiced and varied among the different income-quintiles. The independent determinants of CHE were as follows: age >40 years, male-patient, location, earner-ratio, patient as the earner, caretaker visits, treatment delay, and co-morbidity. It is recommended that health policymakers develop post-MDGs TB-control strategies to ensure free TB-services with financial protection around the globe.

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1. Introduction

The World Bank estimates that tuberculosis (TB) is responsible for a production decrease of 4–7% of the Gross Domestic Product (GDP) of some countries (TB Alliance, 2017). It removes people from the workforce, cutting down on productivity and limiting a country's GDP. Pakistan ranks fifth on the list of 22 TB High Burden Countries (HBCs) (World Health Organization EMRO, 2015), and has about 61% of the total TB burden in the Eastern Mediterranean Region (EMR) (Fatima, 2015). Globally, due to healthcare payments, up to 5% of the population are forced into

poverty each year, about 150 million suffer financial catastrophe, and 100 million are pushed below the poverty line (World Health Organization, 2010). Catastrophic expenditures are out-of-pocket payments for healthcare which exceed the proportion of household income for non-food expenditures; this affects the wellbeing of patients' households by reducing their consumption of goods and services (Ekman, 2007; Li et al., 2012). Catastrophic health expenditures are not necessarily high payments spent on healthcare (Zhou et al., 2016); sometimes even small expenditures can have disastrous financial implications for the poor (Su, Kouyaté, & Flessa, 2006). Therefore, protecting people from catastrophic health expenditures and impoverishment are the concerns of the health policy of national governments (Xu et al., 2003).

Tuberculosis is considered a disease of the poor, as TB is strongly associated with poverty (Zhou et al., 2016). Previous studies have shown that TB is highly prevalent among

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<https://doi.org/10.1016/j.soscij.2018.01.001>

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the poor, who are more vulnerable and at higher risk (Zhou et al., 2012). Also, TB targets people in their most productive years, and over 95% of cases and deaths due to TB are in developing countries (World Health Organization, 2017). Moreover, it is associated with high treatment costs, which aggravate the insecure economic situation of TB patients' households. Despite the availability of free medicines under the DOTS program, several studies have reported that TB patients incur high costs, which have the potential to push low-income people into poverty (Liu et al., 2010). Thus, TB causes huge direct and indirect costs at the micro and macro levels.

Globally, on the macro level, huge funds are needed to eradicate TB. According to the World Health Organization EMRO (2015), the US \$8 billion per year was required in 2015 in response to the global TB epidemic. This excludes research and development for new TB diagnostics, drugs and vaccines. The cost per patient treated for drug-susceptible TB in 2014 fell within the range of US \$100–500 in most countries with high burdens of TB. The cost per patient treated for MDR-TB was most often within the range of US \$5,000–10,000, but the average varied from the US \$6,826 in low-income countries to the US \$21,265 in upper-middle-income countries. In the years 2011–2013, globally, US \$1,728 was given to non-OECD (Organization for Economic Co-operation and Development) countries by WHO. Asia was the highest recipient region with US \$1,300, followed by Africa with US\$ 799 (World Health Organization EMRO, 2015). On average, low-income countries spent US \$516 per TB patient, while upper-middle-income and high-income countries invested an average of US \$5,558. In the 22 high-burden countries (HBCs), the estimated cost per patient treated for drug-susceptible TB in 2014 ranged from the US \$74 (in Pakistan) to the US \$12,988 (in countries of the former USSR). However, HBCs, the cost per patient treated for drug-susceptible TB was less than their GDP per capita.

Studies have also reported that at the micro level, TB significantly impacts households. For instance, out-of-pocket expenditures for the disease accounted for more than 15% of annual households' income, while incomes were reduced by 5% due to illness related effects in Thailand (Kamolratanakul et al., 1999). A similar study conducted in Thailand compared the cost of treatment for different types of TB and revealed that the average cost to MDR-TB patients was 89,735.49 Thai Baht, 17 times higher than smear-negative cases (Kamolratanakul et al., 2002). Needham, Godfrey-Faussett, and Foster (1998) reported that the diagnostic cost of TB was 127% of patients' monthly income (US \$59) in Zambia. Likewise, in Brazil, the estimated cost was US \$194 per patient for complete treatment and US \$189 for the healthcare system. Under DOTS in Pakistan, the cost was US \$336 and US \$726 in healthcare facilities (Steffen et al., 2010), and, in Denmark, the direct estimated cost per TB patient was €10,509 (Fløe et al., 2015). Russell (2004) stated that households in developing countries experience a catastrophic economic burden due to TB treatment, estimated at more than 10% of household income. The same study found the estimated cost per TB patient among immigrants in the Netherlands was €353.

Most of these costs were due to hospitalization and additional work days lost, which accounted with an estimated cost of €2603 (Kik et al., 2009). In South Africa, the mean total direct cost incurred by respondents was US \$111.83, approximately 12% of annual individual income (Foster et al., 2015).

Along with direct costs, indirect costs associated with TB also increase the cost of disease (Saunderson, 1995). For example, Laokri, Dramaix-Wilmet, Kassa, Anagonou, and Dujardin (2014) reported that the indirect median cost associated with TB was US \$131. Likewise, in central India, the average indirect cost associated with TB was US \$204 (Muniyandi, Rao, Bhat, Yadav, & Sharma, 2016). Rajeswari et al. (1999) stated that on average, patients in India incurred an indirect cost equivalent to 83 days of work lost. Other studies have confirmed that indirect cost estimates vary from country to country. For instance, US \$16 in Malawi, (Kemp, Mann, Simwaka, Salaniponi, & Squire, 2007), US \$115 in Bangladesh (Croft & Croft, 1998), and US \$68 in Zambia (Rajeswari et al., 1999). These costs make it clear: tuberculosis carries a huge financial burden worldwide, especially at the household level in developing countries.

In spite of access to free treatment under the DOTS program, financial barriers still prevent patients from seeking healthcare (Laokri et al., 2014). Tuberculosis is a disease of poor, and disproportionately targets people of working age. TB is perpetuating the poverty-cycle, making the poor even poorer; however, only a limited body of literature is available examining the nature of the problem and its impacts at the household level. To the best of our knowledge, there are no relevant studies that have addressed these issues in Pakistan. To address this gap, we conducted a case study in Pakistan to assess the economic consequences of TB and the coping mechanisms practiced at the household level.

2. Materials and methods

2.1. Study area selection

Khyber Pakhtunkhwa was selected due to its high prevalence (in the year 2014) of TB (58,449 new cases) (DHIS, 2014), and also the provincial government's decision to declare TB a notifiable disease. This decision involves medical practitioners, private and government clinics and also community leaders (Government of Khyber Pakhtunkhwa, 2016). It is, therefore, important that the provincial government be aware of the economic consequences of this disease at the household level under the DOTS program. Further, we selected Mardan District as our study site from among the 26 districts of the province due to its possession of the highest DOTS population. It is the 2nd largest district in the province and 19th largest in Pakistan (Government of Pakistan, 2010). The district is administratively divided into three sub-districts: Mardan, Takht Bhai, and Katlang. The total population of the district is about 1.46 million, approximately 0.75 million males and 0.71 million females (Government of Khyber Pakhtunkhwa, 2017).

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