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Abstract

Background: Tuberculosis (TB) is a disease that disproportionately affects the poor. The World Health Organization lists economic factors as one of main barriers to tuberculosis management.

Aims: This study aimed to estimate the household total catastrophic cost of TB and its determinants among newly diagnosed Egyptian tuberculous patients.

Methods: This was a cohort prospective study covering 257 TB patients registered in 2019. The patients were followed up bi-monthly until the end of the treatment regimen (4 visits). A standardized questionnaire published by the poverty sub-working group of the Stop TB Partnership was used after minor modification. The following costs were measured: pre-diagnosis, direct and indirect, guardian and coping, as well as annual household income. Catastrophic cost (direct plus indirect) was considered if the total cost of TB treatment exceeded 20% of the household's annual income. Sensitivity analyses were conducted using different thresholds.

Results: The incidence of household total catastrophic cost was 24.1%. The mean total cost of TB treatment was US$ 198. Over 50% of the total direct cost was incurred during the pre-diagnosis period. After adjustment for other determinant variables using multivariable logistic regression, we found that age 2, poverty and coping were more likely to cause higher total catastrophic cost.

Conclusions: Catastrophic cost was experienced by 1 out of every 4 new TB patients. As the main cost drivers were poverty and coping, the Ministry of Health and Population should be collaborated with Ministry of Finance and NGOs to put a plan of social protection system for poor families with TB patients.

Key words: catastrophic cost, tuberculosis, economic burden, cohort study, Egypt

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Introduction

Tuberculosis (TB) is a disease that disproportionately affects the poor. Therefore, TB programmes need to ensure that economically and socially disadvantaged patients do not face barriers that keep them from seeking treatment. By addressing barriers and the reasons for delay to timely diagnosis and treatment in the National TB Programme (NTP), costs to TB patients, particularly among the poor, can be effectively reduced (1).

Poor people have longer pathways to care, and costs of accessing care are generally higher before than after diagnosis; on average, costs incurred before treatment represented at least 50% of the total cost of the TB episode (2). Out-of-pocket costs for public and private health care services may lie at the beginning of a spiral into poverty for many families and exacerbate poverty among the already-poor. Universal access to care and reducing the socioeconomic burden associated with TB are key objectives of the current WHO Stop-TB strategy. The WHO lists economic factors as one of 4 barriers to TB care (3).

Loss of income and direct expenses trigger a downward spiral whereby the patient is less able

to complete treatment, more likely to have repeat episodes, and more likely to develop drug resistance resulting in more expensive and laborious treatment (4,5).

Many studies have been conducted in Africa and Asia to assess the catastrophic cost of TB for patients and households. The incidence of total catastrophic cost of TB in Uganda was 53.1% (6) and in Zimbabwe 80% (7). In Asia, the reported catastrophic incidence in Indonesia was 36% (8), while in China catastrophic health care expenditure (CHE) was 66.8% (9) and the household catastrophic total cost was 33.6% (10). There is a difference between catastrophic total cost of TB and CHE. According to the WHO definition, catastrophic total costs (direct and indirect combined) incurred during illness and treatment exceed a given threshold (e.g. 20%) of the household's annual income, while CHE is defined as out-of-pocket payments for health care (for all conditions) exceeding a given fraction of a household's total consumption (non-food). The CHE for TB is defined as out-of-pocket medical expenses for TB care exceeding a specific proportion of household income or capacity to pay (11).

Egypt is ranked among the mid-level incidence countries. According to a WHO estimation of the TB burden in 2019, the incidence of TB was 12 per 100 000 inhabitants. The estimated proportion of TB cases with multidrug resistance/rifampicin resistance was 1.4% among new cases and 23.0% among previously treated patients (12). In Egypt, there have been no published studies estimating the catastrophic total costs or CHE for TB at the national level. Accordingly, conducting such a study could be of value in assessing the impact of economic constraints and impoverishment among TB patients and their households.

The main objectives of this study were to measure the incidence of total household catastrophic cost of TB and identify the risk factors associated with it.

Methods

Study design

We used a cohort prospective study to achieve the study objectives. The study cohort included a sample of newly diagnosed TB patients who had been on treatment for at least 2 weeks since starting the intensive phase. All patients were registered in the National TB Programme during the first quarter of 2019. Study patients were followed up bi-monthly (4 interviews for each patient) until the end of the treatment regimen.

Study setting

According to the General Organization of Physical Planning, Egypt is divided into 7 regions (27

governorates): Greater Cairo, Alexandria Region, Delta Region, Suez Canal Region, North Upper, Central Upper and Southern Upper. For simplicity of selection, we combined the regions into 3 sectors: Greater Cairo (3 governorates), North (Alexandria and Delta = 12 governorates) and South (all 3 Upper regions = 10 governorates). We excluded North and South Sinai for security reasons. From the North and South sectors, 4 governorates were randomly selected. From the Middle sector, Cairo was randomly selected. Out of 44 TB management units (TBMUs) in the selected governorates, 24 were randomly selected. A weighted proportional allocated sample from each governorate was calculated depending on the registered number of TB patients in 2018.

Some patients were considered ineligible: those who refused to sign the informed consent, children under 15 years without their guardian's consent or for whom the guardian refused to give consent, and re-treated patients. Multidrug resistant patients were excluded because they need a longer time for follow-up and in some selected centres the number of these patients was very low.

Sampling method and sample size

This was a cluster sample considering the TBMU as a cluster. As there are 24 clusters in the 5 selected governorates, we retrieved around 10–20 patients per cluster. Consecutive consenting eligible patients were interviewed at each study site until the required sample size was reached. The sample size calculated for this study was 276 TB patients using EpiInfo, version 7. The assumptions used for calculation were: estimated household catastrophic cost rate 30% (22–38%), 95% confidence level, design effect of 2.0, and dropout rate of 10%. The assumption of catastrophic cost rate was based on preliminary results of unpublished work done recently in 2 TBMUs in Cairo.

Data collection

A standardized questionnaire from the poverty sub-working group of the Stop TB Partnership, the "Tool to estimate (TB) patient's costs", was used (13). The questionnaire was translated into Arabic and rechecked for proper translation by a public health expert. Then both face and content validity of the questionnaire were evaluated as a routine step in the process of evaluation of the protocol by the Institutional Review Board of the Faculty of Medicine, Ain Shams University. After approval of the protocol, the questionnaire was piloted on 20 TB patients from some TBMUs not included in the study; no changes were made to the questionnaire. Interviews were carried out by trained health care workers with previous experience in interviewing TB patients. The questionnaire covered socioeconomic and demographic variables such as age, sex, marital status, education, employment, household monthly income, place of residence, family size and number of rooms. Other variables were included in the questionnaire such as type of TB and diagnostic delay.

Operational definitions: according to WHO tuberculosis patient cost surveys (11,13)

Catastrophic total costs due to TB comprised total costs of TB (direct and indirect combined) incurred by household during illness and treatment that exceeded 20% of the pre-disease annual household's income.

Direct costs were out-of-pocket costs linked to seeking diagnosis and treatment, including medical expenses, fees, transport, accommodation, food expenditures and other costs, net of any reimbursement.

Indirect costs were self-reported household income loss (net effect of income change before as compared to during TB episode).

Guardian cost was the costs incurred by family members looking after the patient during care. For each guardian, both direct and indirect costs were considered.

Costs incurred by patients who attempted to cope with the costs of TB care included borrowing money or selling their assets to finance care.

Annual income was estimated from the average monthly income reported by the patient. This was calculated from the monthly income before TB symptoms, after diagnosis and at the end of treatment. To assess and value patient's time cost, we used the output-based approach.

Poor status was considered if the household earnings were below 1000 Egyptian pounds per month (those in the first quintile of the monthly income).

Regarding monthly income and all costs incurred by the patients, we collected the data in Egyptian pounds then converted to US$ (US$ 1 = 16.5 Egyptian pounds).

Data analysis

We used SPSS, version 21, for statistical analysis. Descriptive statistics included mean, standard deviation, median, interquartile range, frequency, percentage and 95% CI. Analytical statistics was performed in 2 steps. First, bivariate analysis using the chi-squared test was applied to identify variables associated with catastrophic cost. Crude odds ratios (cORs) with 95% confidence interval were calculated. In the second step, multivariable logistic regression models were constructed and adjusted odds ratios (adj. ORs) were calculated. All variables in the bivariate analyses that expressed P-value