International Journal of Infectious Diseases 32 (2015) 183–190

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

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

Review

The economic burden of Tuberculosis in Denmark 1998-2010. Cost analysis in patients and their spouses

Andreas Fløe [a,*], Ole Hilberg [a], Christian Wejse [b,f], Anders Løkke [a], Rikke Ibsen [c], Jakob Kjellberg [d], Poul Jennum [e]

[a] Department of Respiratory Medicine and Allergology, Aarhus University Hospital, Denmark
[b] Department of Infectious Diseases, Aarhus University Hospital, Denmark
[c] iTracks, Klosterport 4E, 4, Aarhus, Denmark
[d] Danish Institute for Local and Regional Government Research, Copenhagen, Denmark
[e] Danish Center for Sleep Medicine, Department of Clinical Neurophysiology, Center for Healthy Aging, Faculty of Health Sciences, University of Copenhagen, Glostrup Hospital, Copenhagen, Denmark
[f] GloHAU, Center for Global Health, Department of Public Health, Aarhus University, Denmark

ARTICLE INFO

Article history:
Received 17 September 2014
Received in revised form 11 December 2014
Accepted 11 December 2014

Corresponding Editor: Eskild Petersen, Aarhus, Denmark

Keywords:
Tuberculosis
socioeconomic factors
case-control studies
spouses
cost of illness

ABSTRACT

Objective: To evaluate the economic burden of tuberculosis (TB) in Denmark,
Methods: 8,433 Danish TB-patients (1998-2010) were matched with 33,707 controls by age, gender, civil status and geography. Health-related costs (health system contacts and –procedures, medications) and socio-economic parameters (foregone earnings and social transfer expenses) were calculated on data from national databases. The same information was obtained for 3,485 spouses of TB-patients, and 17,403 controls.
Results: Health-related costs were higher for cases throughout the period. Before diagnosis, cases posed € 1,180 more health costs per year than controls. Excess health costs in the 2 years around diagnosing and treating TB were € 10,509. Cases received an average excess public transfer income of € 3,345 before vs. € 3,121 after diagnosis. Average employment income deficiency was € 11,635 before vs. € 13,885 after diagnosis, but the increasing difference showed a linear shape throughout the period. Spouses also had lower income, more social transfer, and posed higher health-related costs than matched controls.
Conclusion: We estimate the direct costs per TB patient to be €10,509. TB patients and their households are characterized by increasingly lower employment income, lower employment rate, and higher dependency on public transfer, but the socio/economic deterioration is rather a risk factor for TB than a direct consequence of the disease.
© 2015 The Authors. Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Worldwide, tuberculosis (TB) remains the deadliest of contagious diseases with almost 9 million new cases and 1.3 million deaths in 2012.[1] Previous studies of the economic burden of TB have mainly focused on direct costs related to hospitalisation and treatment of TB,[2–4] though Miller et al.,[5] found that direct treatment-related expenses accounted for only a minor part of the $ 376,255 total costs for society per TB case. In a European context, Diel et al.,[6] calculated the direct costs of diagnosing and treating a case of pulmonary TB to be € 16,389, and indirect costs to be € 2,461, in 2004. In 2009, the sum of direct and indirect costs had decreased to € 11,239 per adult case (excluding MDR-TB)[7]; close to the €10,282 average in Western Europe according to a 2013 review.[8] The decrease in costs reflects increasing out-patient treatment of TB. Incorporating indirect costs of TB has previously been based on estimated loss in productivity as factual data have generally not been available.

Denmark has a low TB incidence (2012: 6.5 per 100.000 per year).[9] About 66% of TB cases are found among immigrants. The responsibility for treatment and follow-up of TB patients is shared among centralized departments of pulmonary and infectious diseases, while contact investigation procedures are performed at a handful of public departments of respiratory diseases. Guidelines for TB treatment and contact investigations are defined in the national Danish TB-program.[10] In contrast to comparable countries,

* Corresponding author. Præstehaven 69, 8210 Aarhus V, Denmark. Tel.: +45 26360885
E-mail address: andrniel@rm.dk (A. Fløe).

http://dx.doi.org/10.1016/j.ijid.2014.12.021
1201-9712/© 2015 The Authors. Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

the TB incidence in Denmark has not declined in recent years, primarily due to active disease transmission in high risk subpopulations.[11] In Denmark, data on healthcare contacts, medication use, employment information, and social determinants at the person level are linked by the unique civil registration number. This allows reliable calculation of direct and indirect costs of a given disease, and has previously contributed important knowledge of the financial burden of a number of chronic diseases.[12–14]

To our knowledge, no previous studies have evaluated the impact of diagnosing and treating TB on social and economic parameters over time, nor have they addressed the socioeconomic status of spouses of TB patients. The aim of this study was to evaluate health-related costs and socio-economic parameters of patients with active TB and their spouses both before and after diagnosis and treatment in a national, retrospective case-control study.

2. Methods

In Denmark, all hospital contacts are registered in the National Patient Registry (NPR).[15] The NPR includes administrative information, primary and secondary diagnoses and information on diagnostic and treatment procedures using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Primary sector contacts (general practice and specialist care) and the use of medications are recorded in the databases of the National Health Security and the Danish Health and Medicines Agency, respectively.

We extracted data on all patients with a primary or secondary ICD-10 diagnosis of A15 through A19 in the period 1998-2010 (12 years). This includes pulmonary and extra pulmonary TB, but not latent TB (LTBI). We did not control for MDR-TB status, as the incidence in Denmark is very low (2011: 0.48% of TB cases[9]). Data were available for the entire observation period, allowing us to trace patients both retrospectively and prospectively relative to the time of diagnosis.

The Danish Civil Registration System contains information about cohabitation status, marital status, social factors, employment, education, income, pensions etc.[16]. We randomly selected controls matched by age, gender, geographical area and marital status. Patient-to-control ratio was 1:4.

Data from patients and matched controls that could not be identified in the Income Statistics database were excluded, but more than 99% of the observations were successfully matched. If a patient or control was not present in the registry on 1 January in a given year because of death, imprisonment or emigration, the corresponding control or case was excluded.

Spouses were identified by having the same address as a case or by marital status. The random control group for spouses was generated similarly to the control group for TB patients.

Patients, spouses and matched controls were followed through the study period from 1998 to 2010 (or until death). If diagnosis of TB was made in 1998, we were able to follow that individual 11 years forward in time. If the diagnosis was established in 2010, we were able to trace that individual 11 years backwards in time. If the diagnosis was made in 2006, we could trace eight years backwards and four years forward etc. This allowed us to study changes in health costs and socio-economic parameters relative to the TB diagnosis reflecting the impact of TB on these parameters, while baseline differences between cases and controls allowed us to study fundamental socio-economic differences between cases and controls (risk factors for TB).

Health-related costs covered in- and out-patient treatment and medicine expenditures. Average national costs of hospitalisation and outpatient treatment for specific diagnosis-related groups (DRG) were calculated. These data were obtained from Danish Ministry of Health by DRG. It is average *case-mix* of in- and out-patient costs, updated for every year. Specific patient-related outpatient costs were added. Medicine expenditures were obtained from the Danish Health and Medicines Agency as the retail price of each drug (including dispensing costs) multiplied by the number of transactions. The frequencies and costs of consultations with general practitioners and other specialists were based on National Health Security data.

Socio-economic parameters included costs for society and patients, such as reduced employment benefits and social transfer payments. In Denmark, social transfer payments comprise subsistence allowances, pensions, social security, social assistance, publicly funded education support, and others. Indirect costs were based on income figures from Income Statistics. Costs were measured on an annual basis and adjusted to 2010 prices using Statistics Denmark's general price index. All costs were calculated in DKK and converted to Euros (€1: DKK 7.45).

2.1. Statistical analysis and ethical considerations

The study was approved by the Danish Data Protection Agency. Data handling did not involve revealing the identity of any patients or control subjects, so ethical approval was not required. Some patients had extremely high resource consumption, leading to a skewed distribution. From a societal perspective, this should be reflected in the results, and therefore, data were presented as means rather than as medians. Statistical analysis was performed using SAS 9.1.3 (SAS, Inc., Cary, NC, USA). Statistical significance of the cost estimates was established from two-sided t-tests based on bootstrap analysis.[17,18] A significance level of 0.05 was assumed for all tests.

3. Results

3.1. Demography

We identified and extracted 8,433 patients from the NPR, and 33,707 matched controls. Age, gender and educational level of the study population are shown in Table 1. We found more male (55.4%) than female (44.6%) patients, consistent with recent

Table 1
Distribution of age, gender and educational level among cases and controls

	Case		Control	
Age	N	%-Share	N	%-Share
<20	1,140	13.5	4,559	13.5
20-29	1,136	13.5	4,542	13.5
30-39	1,492	17.7	5,964	17.7
40-49	1,359	16.1	5,432	16.1
50-59	1,104	13.1	4,406	13.1
60-69	874	10.4	3,495	10.4
70-79	847	10	3,387	10
>=80	481	5.7	1,922	5.7
All	**8,433**	**100**	**33,707**	**100**
Gender	**N**	**%-Share**	**N**	**%-Share**
Male	4,668	55.4	18,655	55.3
Female	3,765	44.6	15,052	44.7
All	**8,433**	**100**	**33,707**	**100**
Education	**N**	**%-Share**	**N**	**%-Share**
Primary	3,197	37.9	10,438	31.0
Secondary	508	6.0	2,219	6.6
Vocational	1,598	18.9	9,253	27.5
Short college	235	2.8	1,280	3.8
Medium college	450	5.3	3,221	9.6
Master/phd	211	2.5	1,791	5.3
Unknown	2,234	26.5	5,505	16.3
All	**8,433**	**100.0**	**33,707**	**100**

Download English Version:

https://daneshyari.com/en/article/3362222

Download Persian Version:

https://daneshyari.com/article/3362222

Daneshyari.com