Parametric Survival Modelling of Risk Factor of Tuberculosis Patients under DOTS Program at Hawassa Town, Ethiopia

Fikadu Zawdie Chere, Department of Statistics, Wolaita Sodo University, Wolaita Sodo, Ethiopia
Yohannes Yebabe Tesfay, Faculty of Economics, Informatics and Social Change, Molde University College, Molde, Norway
Fikre Enquoselassie, Department of Preventive Medicine, Addis Ababa University, Addis Ababa, Ethiopia

ABSTRACT

Tuberculosis (TB) is a chronic infectious disease that has a major health problem over the centuries. This study assessed the risk factors associated with time to death among TB patients treated under directly observed short course treatment program in Health facilities in Hawassa city, Ethiopia. The authors analysed data from a cohort of 1604 TB patients recruited between September 2008 to September 2011. They apply the parametric regression model of survival data analysis. The best fitted parametric regression model is selected by using the Akaike information criterion (AIC). The AIC confirms that the Weibull regression model is found to be the best fit of the survival of tuberculosis patients under the DOTS program at Hawassa town, Ethiopia. The fit of the Weibull regression model result revealed that sex, age, baseline weight, HIV status, category of patients and year of enrolment are the significant factor for the survival of TB patients.

Keywords: DOTS, Hawassa City, Parametric Regression Model, Parametric Survival Data Analysis, Risk Factors, Tuberculosis Patients

1. INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease that has a major health problem over the centuries and it has accounted for misery that is more human, suffering and loss of earning and failure of economic and social development than any other disease (USAID 2009). According to World Health Organization (WHO) estimation, about one third of the world’s population is infected with tuberculosis bacteria, about ten million cases of active disease are estimated to occur each year, and annually three million people die of tuberculosis (WHO 2008). Although
a cure for tuberculosis was developed more than 50 years ago, TB remains one of the world’s deadliest infectious diseases. Tuberculosis is among the top ten causes of global morbidity and mortality (USAID 2009).

There were estimated 8.9 to 9.9 million incident cases of TB, 9.6 to 13.3 million prevalent cases of TB, an estimated 1.3 million (range 1.1 to 1.7 million) deaths, including 0.5 million (range 0.45 to 0.62 million) deaths among women, occurred among HIV negative incident cases of TB, and there were an estimated 0.5 million deaths among incident TB cases who were HIV-positive in 2008 (WHO 2009). In 2005, 15.4 million TB cases were reported globally, among 8.8 million people new TB cases, 3.9 million were smear positive, and 1.7 million people died of TB in the same year (WHO 2005). Ninety eight percent of TB deaths occur in the developing countries and if left unchecked, within 20 years, TB will kill about 35 million people (WHO 2005). WHO developed the DOTS strategy as the internationally recommended approach to TB control in the mid-1990. DOTS is also the foundation of the Stop TB Strategy, which was launched by WHO in 2006 to guide TB control efforts during the period 2006 to 2015. The start of WHO efforts to systematically monitor progress in TB control on an annual basis in 1995 coincided with global promotion and expansion of the DOTS strategy (WHO 2009).

In Ethiopia, TB has long been recognized as a major public health problem since the 1950s (FMOH 2009) and the country has been implementing the WHO recommended DOTS (Directly Observed Treatment Short-course) strategy since 1992 (WHO 2008). At present, TB control strategy in Ethiopia relies on WHO recommended Stop TB Strategy and it has been implemented in the country since 2006 (MOH 2008). According to the 2008 WHO TB report (WHO 2008), Ethiopia ranks 7th in the list of the world’s 22 highest burden countries for TB with an incidence estimated at 379/100,000 for all forms of TB and 168/100,000 for smear positive TB. According to the Ministry of Health hospital statistics data, the TB mortality rate is estimated at 84 per 100,000 populations per year (FMOH 2009).

In the Southern Ethiopia Regional State (SNNPRS), TB is among the leading causes of sickness and death (FMOH 2009). As in many other resource-constrained settings, treatment outcomes for tuberculosis have not been satisfactory (WHO 2008), mainly due to poor treatment compliance and low coverage of short course chemotherapy (SCC). Delays in the diagnosis and treatment initiation, the devastating HIV/AIDS epidemic and the potential threat of anti-tuberculosis drug resistance represents serious threats to the TB control effort in the region. The HIV co-infection among TB patients in the region is estimated at 19% (MOH 2008).

TB mortality has been variously attributed to a dramatic rise in drug resistance (Toungousova et al. 2004), and to deteriorations in TB services (Shilova 2001, Atun et al. 2005) and the risk of dying could be reduced through improved care (Vasankari et al. 2007, Zevallos et al. 2003). So to avert the problem of TB mortality, policy makers should devise a plan, with clear reflection on the survival probability and associated risk factors of TB, to improve the quality and standard of TB care. That is the reason why this study was motivated to determine the risk factors associated with death among a cohort of TB patients treated under DOTS program in Hawassa city, Ethiopia. This study explores the statistical models, with a focus on survival models, in predicting the survival probability and evaluating the association of the factors with survival probability of tuberculosis patients under the DOTS program.

2. THE PROBLEM

The Millennium Development Goal (MDG) number six aims at combating HIV/AIDS, malaria and other diseases by 2015. Accordingly, TB is one of the diseases that is categorized as others.
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