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Economic Burden of Bacteremic Melioidosis in Eastern and Northeastern, Thailand

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Abstract. Melioidosis is among the most common causes of septicemia in Thailand, but data on economic burden are limited. We describe the economic impact of bacteremic melioidosis hospitalizations in two Thailand provinces during 2006–2008. Costs are presented in US dollars ($1 = 30.49 Thai Baht). The average annual incidence of bacteremic melioidosis cases per 100,000 persons in Sa Kaeo and Nakhon Phanom was 4.6 and 14.4, respectively. The annual cost of bacteremic melioidosis hospitalizations from the societal perspective, including direct and indirect costs, was $152,159 in Sa Kaeo and $465,303 in Nakhon Phanom. The average cost per fatal case was $14,182 and $14,858 in Sa Kaeo and Nakhon Phanom, respectively. In addition to the high morbidity and mortality, the substantial economic burden of melioidosis further supports the need for investments to identify improved prevention and control strategies for melioidosis.

INTRODUCTION

Melioidosis is known to be endemic in tropical areas between latitudes 20°N and 20°S, predominantly in southeast Asia, northern Australia, Papua New Guinea, India, southern China, Hong Kong, and Taiwan.[1] It has been estimated that around 2,000 to 3,000 cases of melioidosis occur each year in Thailand.[2] The annual incidence in northeastern provinces of the country has been estimated to be 12.6–14.9 cases per 100,000 persons.[3,4]

The high melioidosis incidence in endemic countries likely carries a high economic burden. Melioidosis therapy requires intensive antimicrobial treatment in the acute phase as well as prolonged eradication treatment. In addition to this expensive antimicrobial regimen, costs are especially high for patients requiring intensive care unit admission, which account for 38% of hospitalized patients with melioidosis.[5] Furthermore, melioidosis has a high mortality rate,[4] which could lead to substantial economic impact to society in terms of productivity losses. Although data are available on the economic impact of other high-burden diseases in Thailand (e.g., dengue fever[6] and tuberculosis[7]), we were unable to identify any previously published data on the economic burden of melioidosis in Thailand.

We aim to describe the economic burden of bacteremic melioidosis from the societal perspective, including direct and indirect costs related to morbidity and mortality, using data from one eastern and one northeastern province in Thailand.

MATERIAL AND METHODS

Setting. This study was conducted in two Thailand provinces, Sa Kaeo in the eastern region of the country with a 2007 population of 531,884 and Nakhon Phanom in the northeast with a population of 738,184. The 2007 per capita income in Sa Kaeo was 56,092 Baht ($1,839), and the 2007 per capita income in Nakhon Phanom was 30,244 Baht ($992) (Table 1). Both provinces have primarily agrarian-based economies and share common occupations, including farming and raising livestock.

Study sites. In 2005, we established active population-based surveillance for bloodstream infections in all hospitals in Sa Kaeo (1 provincial and 7 district hospitals), an area not usually thought of as highly endemic for melioidosis, and Nakhon Phanom (1 provincial and 11 district hospitals), an area known to have high melioidosis rates.[4,5] Automated blood culture systems (BacT/ALERT 3D, bioMérieux Inc., Durham, NC) were implemented in the provincial hospital in each province to enhance detection of blood-borne pathogens in patients hospitalized for community-acquired pneumonia or suspected sepsis.[8] Blood cultures from all other hospitals in each province were processed at provincial hospitals within 24 hours. Cultures positive for *Burkholderia pseudomallei* were confirmed by the National Institutes of Health, Thailand Ministry of Public Health. The enhanced laboratory capacity and surveillance system allowed estimation of population-based incidence of invasive bacterial infections,[8] including melioidosis.[4] We defined a case of bacteremic melioidosis as blood culture-confirmed *B. pseudomallei* infection in a patient hospitalized in Sa Kaeo or Nakhon Phanom from January 1, 2006 to December 31, 2008.

Data collection. Medical records of bacteremic melioidosis case-patients were reviewed for demographic and clinical characteristics, length of hospital stay, and outcome at the time of discharge. Patients who were discharged in moribund condition were categorized as fatal cases. For patients with unconfirmed vital status at discharge, outcome was considered unknown.

Cost estimation. The total cost attributable to hospitalized bacteremic melioidosis cases was calculated from the societal perspective and included three types of costs: direct medical costs, direct non-medical costs, and indirect costs because of morbidity and pre-mature mortality.

Direct medical costs. Hospital charge data for case-patients were obtained from the Central Office of Healthcare Information and the National Health Security Office (NHSO), Thailand. We linked each case hospitalization to the corresponding record in the NHSO database to obtain hospital charge information. We estimated direct medical cost by converting charge data to costs using a cost-to-charge ratio of 0.88 and 0.93 for provincial and district hospitals, respectively.[9] All costs in 2006–2008 were converted to 2011 values using the consumer price index for

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