



Willingness to pay for a dengue vaccine and its associated determinants in Indonesia: A community-based, cross-sectional survey in Aceh



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ARTICLE INFO

Article history:

Received 19 July 2016

Received in revised form

25 November 2016

Accepted 27 November 2016

Available online 28 November 2016

Keywords:

Dengue fever

Dengue vaccine

Indonesia

Vaccine introduction

Vaccine demand

Willingness to pay

ABSTRACT

Vaccination strategies are being considered as a part of dengue prevention programs in endemic countries. To accelerate the introduction of dengue vaccine into the public sector program and private markets, understanding the private economic benefits of a dengue vaccine is therefore essential. The aim of this study was to assess the willingness to pay (WTP) for a dengue vaccine among community members in Indonesia and its associated explanatory variables. A community-based, cross-sectional survey was conducted in nine regencies of Aceh province, Indonesia, from November 2014 to March 2015. A pre-tested validated questionnaire was used to facilitate the interviews. To assess the explanatory variables influencing participants' WTP for a dengue vaccine, a linear regression analysis was employed. We interviewed 677 healthy community members; 476 participants (87.5% of the total) were included in the final analysis. An average individual was willing to pay around US-\$4 (mean: US-\$4.04; median: US-\$3.97) for a dengue vaccine. Our final multivariate model revealed that working as a civil servant, living in the city, and having good knowledge on dengue viruses, a good attitude towards dengue, and good preventive practice against dengue virus infection were associated with a higher WTP ($P < 0.05$). Our model suggests that marketing efforts should be directed to community members who are working in the suburbs especially as farmers. In addition, the results of our study underscore the need for low-cost quality vaccines, public sector subsidies for vaccinations, and intensifying efforts to further educate and encourage households regarding other dengue preventive measures, using trusted individuals as facilitators.

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1. Introduction

Dengue, an acute mosquito-borne viral infection, is rapidly spreading in all WHO regions with approximately 390 million new infections annually and 96 million symptomatic cases ranging from mild dengue fever (DF) to dengue hemorrhagic fever (DHF) and

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dengue shock syndrome (DSS) (Bhatt et al., 2013). Approximately half of the world's population is at risk of dengue infection, and about 70% of those at risk live in Southeast Asia and the Western Pacific region (Shepard et al., 2013). Within this region, Indonesia is the biggest country where dengue infection is prevalent. In the last 45 years, the incidence of registered dengue cases in Indonesia has rapidly increased from 0.05 to approximately 40 per 100,000 population (Karyanti et al., 2014).

The observed upward trend of reported dengue cases in Indonesia indicates, in part, that the dengue prevention and control programs in place have not been effective, or not effective enough, to reduce the number of dengue infections. Recently, a new dengue vaccine has been approved in some countries and vaccination has been considered as a part of the dengue prevention programs of endemic countries. However, the current lack of assessments of the economic and public acceptance of a dengue vaccine may cast uncertainty on the adoption of dengue vaccination strategies in certain regions, especially in middle-income countries (Lee et al., 2015). Middle-income countries such as Indonesia generally face hard decision making on whether and how to incorporate new and potentially expensive vaccines within their budget-constrained national vaccination programs (Hadisoemarto and Castro, 2013). Therefore, understanding the private economic benefits of potential dengue vaccines is necessary for an accelerated introduction of dengue vaccine into the public sector program and private markets.

So far, three studies regarding the willingness to pay (WTP) for dengue vaccine have been published (Hadisoemarto and Castro, 2013; Lee et al., 2015; Palanca-Tan, 2008); one of these was conducted in Bandung, Java Island, Indonesia (Hadisoemarto and Castro, 2013). As the cultural and economic backgrounds of that setting differ from those of other populations outside of Java Island, it is important to also assess the WTP among people from other backgrounds in Indonesia. Aceh is one of the regions in Indonesia where dengue infection is hyperendemic and the number of cases has risen significantly especially following the earthquake and tsunami disaster of 2004. This study sought to assess the WTP for a dengue vaccine and its associated modifiable determinants of community members in Aceh, Indonesia in order to generate recommendations for policy makers in dengue endemic areas.

2. Methods

2.1. Study site, sampling procedure and sample size

The study presented in this paper was conducted in nine regencies in Aceh province, Indonesia. Aceh comprises predominantly rural areas located in the north of Sumatra Island in the westernmost part of the Indonesian archipelago. It was the most severely affected area during the earthquake and tsunami disaster of 26 December 2004. The incidence of registered dengue cases in Aceh increased significantly from 2.76 per 100,000 population in 2003 to 46.66 per 100,000 in 2014 (Depkes RI, 2012; Kemenkes RI, 2015). A report by the Provincial Health Office indicated that the total number of registered dengue cases in Aceh was 2208 in 2014 (Provincial Health Office, 2015). Aceh has 23 regencies (*Kabupaten/Kotamadya*) with an estimated population of 4,906,800 in 2014 (BPS, 2015). To represent the population, nine regencies were randomly selected (Aceh Tengah, Aceh Besar, Aceh Utara, Aceh Singkil, Aceh Selatan, Aceh Timur, Aceh Tamiang, Langsa and Sabang). As a minimal sample size, 385 participants were required based on the following assumptions: (a) 50% vaccine acceptability rate; (b) 5% margin of error; and (c) 95% confidence level. The participants were selected based on a judgmental sampling method.

2.2. Study design and instruments

To assess the WTP for a dengue vaccine and its potential explanatory variables, a cross-sectional survey of communities was conducted from November 2014 to March 2015. To facilitate the interviews, a set of questionnaires adopted from previous studies was used (Abdullah et al., 2013; Dhimal et al., 2014; Filmer and Pritchett, 1999; Hadisoemarto and Castro, 2013). The questionnaires had been developed to measure participants' WTP for a dengue vaccine and to collect information on their demographic background, economic status, history of past episodes of DF, knowledge, attitude and practice (KAP) regarding dengue, and attitude towards vaccination practice. To validate the research instrument, a pilot study to assess the reliability of the questionnaires was conducted in two regencies of Aceh province (Aceh Barat Daya and Aceh Pidie Jaya) prior to the survey. The reliability of questionnaires for the KAP domain and other domains used in this study was reported elsewhere (Harapan et al., 2016a).

2.3. Study variables

2.3.1. Response variable

To assess the WTP for a dengue vaccine, it was hypothesized that a safe and fully protective dengue vaccine against dengue viruses was available. To determine the amount of money that participants would be willing to pay for a dengue vaccine, a list of dengue vaccine prices was provided in interval (the median: free; 10,000; 17,500; 37,500; 62,500; 87,500; 150,000 and 200,000 Indonesian Rupiah [IDR], equivalent to US-\$ 0.73, 1.28, 2.75, 4.58, 6.41, 11.00 and 14.66, using a May 2016 exchange rate). For the analysis presented in this article, the median of the intervals and US-\$ values were used. The participants were asked to answer whether they were "very likely", "likely", "undecided", "unlikely" or "very unlikely" to buy the vaccine at each particular price, in an ascending manner. This technique was a modification of the model proposed previously (Blomquist et al., 2009). If the participant refused to accept the free dengue vaccine, the interview was terminated. If the participant accepted the dengue vaccine and was willing to pay the lowest price (US-\$ 0.73), the price was then increased until the participant was no longer willing to pay, i.e., "unlikely" or "very unlikely" as answer were reached. The WTP was defined as the highest accepted price, i.e., the highest price the participants said they were still "very likely" or "likely" willing to pay.

2.3.2. Explanatory variables

a Demographic data and personal history of past dengue fever

The basic demographic background such as age, gender, educational attainment, type of occupation, marital status, monthly income and type of residence were collected. The date of birth was recorded and converted into actual age. The educational attainment was defined as the highest level of formal education completed. Five general types of occupation were assigned to classify occupation based on the main job of the participants: (1) farmer; (2) civil servant; (3) private sector employee; (4) entrepreneur (owned a small-scale business, or traders in the market) and (5) student or university student. Monthly income was defined as the average amount of money earned by participants each month. Type of residence was divided into city (located in the capital city of a district [*kecamatan*] or regency [*kabupaten*]) and suburb (located in the villages [*desa*]). Inhabitants of the cities mostly worked as civil servants, in the market or had their own small business while inhabitants of the suburbs mostly worked as farmers. In addition, the participants' history of previous episodes of DF, and having family members who had suffered from DF, were also collected.

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