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Cost-Effectiveness Analysis of Hepatitis B Immunization in Vietnam: Application of Cost-Effectiveness Affordability Curves in Health Care Decision Making

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A B S T R A C T

Objectives: To perform a cost-effectiveness analysis and to identify the cost-effectiveness affordability levels for a newborn universal vaccination program against hepatitis B virus (HBV) in Vietnam. **Methods:** By using a Markov model, we simulated a Vietnamese birth cohort using 1,639,000 newborns in 2002 and estimated the incremental cost-effectiveness ratios for quality-adjusted life-year gained following universal newborn HBV vaccination. Two types of analyses were performed, including and excluding expenditures on the treatment of chronic hepatitis B and its complications. We used Monte Carlo simulations to examine cost-effectiveness acceptability and affordability from the payer's perspective and constructed a cost-effectiveness affordability curve to assess the costs and health effects of the program. **Results:** In the base-case analysis, newborn universal HBV vaccination reduced the carrier rate by 58% at a cost of US $42 per carrier averted. From the payer's perspective, incremental cost-effectiveness ratio per quality-adjusted life-year gained was US $3.77, much lower than the 2002 per-capita gross domestic product of US $440. Vaccination could potentially be affordable starting at a US $2.1 million budget. At the cost-effectiveness threshold of US $3.77 per quality-adjusted life-year and an annual budget of US $5.9 million, the probability that vaccination will be both cost-effective and affordable was 21%. **Conclusions:** Universal newborn HBV vaccination is highly cost-effective in Vietnam. In low-income, high-endemic countries, where funds are limited and the economic results are uncertain, our findings on the cost-effectiveness affordability options may assist decision makers in proper health investments.

Keywords: acceptability, affordability, cost-effectiveness, incremental cost-effectiveness ratio, quality-adjusted life-year.

Introduction

The hepatitis B virus (HBV) is one of the most prevalent bloodborne viruses worldwide and is a major cause of chronic liver diseases and hepatocellular carcinoma [1,2]. It is an important public health problem for developing countries where the endemicity is generally high. Currently, about 350 million people worldwide are chronic HBV carriers, as demonstrated by the presence of hepatitis B surface antigen for more than 6 months [3]. These individuals are at a much higher risk of liver damage; 15% to 40% of the infected patients eventually develop cirrhosis, liver failure, or hepatocellular carcinoma, contributing to more than 1 million deaths annually [1,4,5]. Epidemiological studies have reported that the prevalence of chronic hepatitis B (CHB) surface antigen carriers is between 8.8% and 20.5% across different populations and regions in Vietnam [6,7]. With a population of 86 million in 2010, there would be more than 7.5 million people at risk of premature death due to HBV infections in Vietnam.

Universal newborn HBV vaccination could be a feasible and effective solution for preventing HBV infection and a cost-effective prevention in the developing world [8,9]. In Vietnam, hepatitis B vaccine was first introduced into the Expanded Program of Immunization in 1997, but universal HBV vaccination was not completed until mid-2003 with the support from the Global Alliance for Vaccines and Immunizations starting in 2002 [10]. To date, data are lacking regarding the impact of universal newborn vaccination in Vietnam from a health-economic perspective. While cost-effectiveness analyses of universal HBV vaccination have been extensively performed for many developed countries, such analyses are still scarce for the developing world [9].

To aid allocation decisions on scarce health care resources, it is important to assess the cost-effectiveness of any large-scale prevention programs, which require substantial resources. In this ar-

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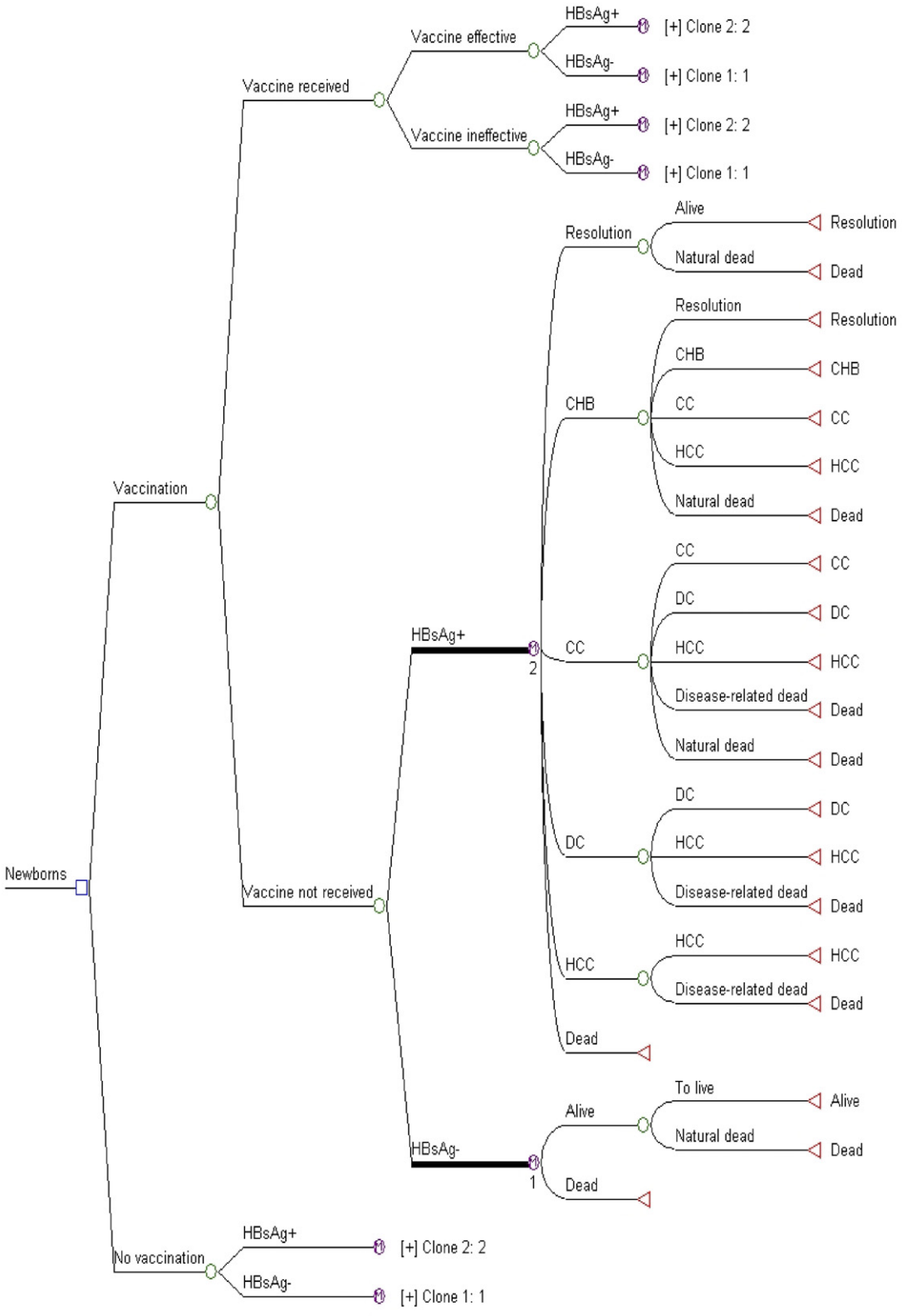

* CHB = Chronic hepatitis B; CC = Compensated cirrhosis; DC = Decompensated cirrhosis; HCC = Hepatocellular carcinoma; HBsAg = Hepatitis B surface antigen

Fig. 1 – Decision analytic model for estimating the cost-effectiveness of universal hepatitis B vaccination in Vietnam. CC, compensated cirrhosis; CHB, chronic hepatitis B; DC, decompensated cirrhosis; HbsAg, hepatitis B surface antigen; HCC, hepatocellular carcinoma.