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Original Article

Expected Hepatocarcinoma Cancer Rate Due to Escape Mutant among Local Population in Thailand: The Situation after the Implementation of Universal Hepatitis B Vaccination at Birth

Abstract

Background: Chronic hepatitis B infection is an etiology of hepatocellular carcinoma. The high prevalence of hepatitis B can be seen in several regions including Indochina. In Thailand, a country in Indochina, according to the local public health policies, the universal hepatitis B vaccination is freely given to any infant at birth without charge. Despite the universal vaccination, the hepatitis B seropositive rate is still observed, and it can still be a cause of hepatocellular carcinoma among the hepatitis B carriers in the future. **Methods:** Here, the authors try to estimate the expected hepatocarcinoma cancer rate due to escape mutant among local population in Thailand, the situation after the implementation of universal hepatitis B vaccination at birth. **Results:** Based on the present study, the mutant escape contributes to only a few parts of overall estimated cancer cases in the situation that there is an implementation of universal hepatitis B vaccination at birth. **Conclusion:** Efficacy of theuniversal hepatitis B vaccination is not improved by specific management on escape mutants.

Keywords: *Escape mutant, hepatitis B, Thailand, universal, vaccination*

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Introduction

Hepatocarcinoma is prevalent in tropical Asia. In Southeast Asia, this cancer is highly prevalent. The two common etiologies for hepatocellular carcinoma in this area are chronic hepatitis B infection and alcoholic drinking. Focusing on hepatitis B infection, it is endemic in tropical Southeast Asia and approved as an important cause inducing high prevalence of hepatocellular carcinoma in this area.[1] In Thailand, according to the local public health policies, the universal hepatitis B vaccination is freely given to any infant at birth without charge.[2] This policy is approved for the effectiveness in reduction of the hepatitis B seropositive rate from 4.3% to 0.3%.[3]

Despite the universal vaccination, the hepatitis B seropositive rate is still observed, and it can still be a cause of hepatocellular carcinoma among the hepatitis B carriers in the future. The nonresponsiveness to hepatitis B vaccine can be due to several reasons including existence of escape mutant.[4] Here, the authors try to estimate the expected hepatocarcinoma cancer rate due to escape mutant among local population in Thailand, the situation after the implementation of universal hepatitis B vaccination at birth.

Materials and Methods

This is a mathematical model study aiming at finding the expected hepatocarcinoma cancer rate due to escape mutant among local population in Thailand, the situation after the implementation of universal hepatitis B vaccination at birth. The estimated cancer rate can be derived according to this formula, "estimated hepatocarcinoma cancer rate = hepatitis B seropositive rate among local people × cancer conversion rate". Focusing on the effect of escape mutation, the fraction of expected cancer case due to escape mutation can be estimated by this formula, "estimated hepatocarcinoma cancer rate due to escape mutant = estimated hepatocarcinoma cancer rate × escape mutant prevalence." For running of the model, the basic data from local reports are used.

Results

According to the available local data, the hepatitis B seropositive rate among local

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people in the period after implementation of universal hepatitis B vaccination at birth is equal to 0.3%.[3] The referencing cancer conversion rate at chronic 30-year hepatitis B infection is referred to Asian ethic group study and is equal to 11%.[5] The estimated hepatocarcinoma cancer rate is hereby equal to "0.3% × 11%" or 0.033%. This is estimated 3300 cancerous cases per ten million local Thai population.

Focusing on the prevalence of escape mutant among the Thai people, the reported prevalence is equal to 14% of vaccine failure case.[6] Focusing on the efficacy of vaccine among the Thais, seroprotection is only 58.6% or 41.4% failed.[7] Hence, the estimated prevalence of scape mutant among the Thais will be "14% × 41.4%" or equal to 5.796%. Hence, the estimated hepatocarcinoma cancer rate due to escape mutant will be equal to "5.796% × 0.033%" or 0.00017388%. This is estimated 17 cancerous cases per ten million local Thai population.

Discussion

Chronic hepatitis B infection is an important public health problem in tropical Southeast Asia. The hepatocellular carcinoma due to chronic hepatitis infection becomes the big problem for the local public health workers. To correspond to the problem, the implementation of universal hepatitis B vaccination at birth has been done for a long time. Nevertheless, there is still no success in getting rid of the problem. Although the reduction of the seropositive rate can be achieved,[3] many estimated cancer cases are still observed. This means that there is a need for reanalysis of the vaccination policies and practice to find the pitfall and correct it.

Of several possible causes of failure, the mutant escape is usually referred to. Nevertheless, based on the present study, the mutant escape contributes to only a few parts of overall estimated cancers cases in the situation that there is an implementation of universal hepatitis B vaccination at birth. Hence, the focus on management of escape mutants gives not much advantage to improve the efficacy of the universal hepatitis B vaccination program.

Conclusion

In Thailand, escape mutants management contribute no additional efficacy of theuniversal hepatitis B vaccination program.

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Conflicts of interest

There are no conflicts of interest.

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