Hepatitis A Vaccination: Is It Necessary For Thai Adults?

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Abstract

Background: Hepatitis A infection is a common infectious disease in many tropical countries. Thailand is an endemic area of this disease. Recommendation of hepatitis A infection has been set in many countries.

Objective: to determine if adults would benefit from hepatitis A vaccination in Thailand

Methods: Here, we performed a cost-benefit analysis to find out the proper strategies for Thailand. Three strategies were tested in this study; a) no intervention, b) vaccination without screening and c) vaccination after screening. Review of the literature was performed in order to set the path probability of each strategy. Cost of each intervention was also identified. The outcome was assigned as the economical loss due to the possible hepatitis A infection for each strategy. Benefit was set as the final total cost according to each strategy (cost of intervention and economical loss due to the possible hepatitis A infection).

Results: Of interest, the most benefit was got from the no intervention strategy. While the vaccination after screening was the worst strategy.
Conclusions: Hence, we do not recommend hepatitis A vaccination for Thai adults.

INTRODUCTION

Hepatitis A has been recognized as a growing child health problem within the last decade. This disease is easily transmitted via the fecal-oral route and from person-to-person. In some cases hepatitis A may also be spread through contaminated water and food. This acute illness has a sudden onset with fever, malaise, jaundice, anorexia, and nausea being the most common clinical manifestations. In infants and preschool children, however, infection may occur without the presence of jaundice, and mild nonspecific symptoms may be the only manifestation. Children may easily spread the infection to household adults who demonstrate more serious clinical manifestations and subsequent liver disease (Cuthbert , 2001; Kemmer and Miskovsky, 2000). Chronic infection as a result of hepatitis A is very unusual and fulminant cases of infection are rare unless the individual also has hepatitis B. According to the 15 th edition of Harrison's textbook of Internal Medicine, the mortality of hepatitis A infection is less than 0.1% or 1/1,000 or so. In the U.S. there are about 100 deaths resulting from hepatitis A per year.

This infection is a common infectious disease in the tropical countries including Thailand (Kosuwan et al, 1996). Because hepatitis A infection is a viral infection with non-specific treatment, the preventive strategies should be used. One of the present preventive strategies is hepatitis A vaccination. The recommendation for immunization against hepatitis A was issued primarily for travelers who might come in contact with contaminated food and water in the endemic area (Marchou, 1998) and persons who were particularly susceptible to hepatitis A infections (Bell, 2000). Also in many countries, recommendation of hepatitis A infection has been set (Bell, 2000; Van Damme and Van der Wielen, 2001). However, the endemic area of this disease is the developing countries, therefore, the affordability to the vaccination cost should be concerned. A cost effectiveness analysis for the alternative preventive strategies for each setting should be performed before implementation of such a preventive strategy. Here, we go to the challenge question " Is it worth vaccinating the Thai adults against hepatitis A infection?"

MATERIALS AND METHODS

This study was performed as a cost effectiveness analysis of several alternative strategies for vaccinating Thai adults towards hepatitis A infection. We focused the adult group (age 18 years old and above) because there have never been cost effectiveness analysis for this population in Thailand.

According to our study, a crucial factor in choice of a strategy for hepatitis A vaccination is consideration of the likely costs and benefits of various alternatives. Concerning the benefit, the most benefit is set as the least expensive. The tested strategies in this study were 1) no intervention, 2) vaccination without screening and 3) vaccination after screening. The hepatitis A vaccine mentioned in this study is the inactivated type, which present high immunogenicity at the range 98 - 100 % (Lopoez et al, 2001; Linglof T et al, 2001). In this study, we accepted the immunogenicity at the level 99 %.

RESULTS

COST IDENTIFICATION FOR EACH ALTERNATIVE STRATEGY

At first the cost identification for investment of each alternative strategy was performed. According to our study, the costs were estimation in baht (42 baht = 1 USdollar). We used the primary data from the Financial Unit, King Chulalongkorn Hospital in our cost identification study. Only the direct cost involving in each alternative strategy (cost of hepatitis A screening test and cost of hepatitis A vaccine) was used in our cost identification.

Concerning the first strategy, no intervention, the cost identification for investment gave the cost equal to 0 baht. Concerning the second strategy, vaccination without screening, the cost identification for investment gave the cost equal to 1,430 baht (derived from the cost of one dosage of hepatitis A vaccine = 1,430). Concerning the third strategy, vaccination after screening, the cost identification for investment gave the cost equal to 1,710 baht (derived from the cost of two dosage of hepatitis A vaccine plus cost of hepatitis A screening test = 1,430 + 280).

DETERMINATION FOR THE EFFECTIVENESS OF EACH STRATEGY

The effectiveness in this study is the difference between the investment cost and the expected lost for each alternative strategy. Epidemiology data relating to the outcome of each alternative strategy (prevalence of natural immunity, immunogenicity of vaccine, prevalence of infection in susceptible group and outcome of infection) used in estimation of the expected lost for each alternative strategy were presented in Table 1 (Linglof T et al, 2001; Lopoez et al, 2001; Kosuwan et al, 1996; Willner et al, 1998). Then the expected lost of each alternative strategy was calculated according to the assigned path probability (Table 2). The lost mentioned in this study included the direct lost (drug cost and hospitalization cost), and indirect lost (cost in loss of productivity relative to net income per capita per year and transportation cost) in each infection as described in a recent previous study (Berge et al, 2000). As the model in 100 adults, the calculated lost of each alternative strategy was shown in Table 3. After complete finding of the expected lost, the effectiveness of each alternative strategy, the benefit defined as the total cost (cost in performing of the strategy derived from the previous cost identification process plus expected lost) was calculated and presented in Table 4. In interest, according to our analysis, the most benefit was got from the no intervention strategy (Table 4). While the least benefit strategy, resulting in the most total cost, was in the alternation “vaccination after screening”.

Figure 1

Table 1: Epidemiology data relating to the outcome of each alternative strategy.

Parameter	%
Prevalence of natural immunity	
▫ Have	97.0
▫ Not have	3.0
Immunogenicity of vaccine	
▫ Effective (prevent)	96
▫ Not effective (susceptible)	4
Prevalence of infection in susceptible group	0.08
▫ Infection (disease)	99.92
▫ Not infection (not disease)	
Outcome of infection	90.76
▫ OPD case	9.24
▫ IPD case	

Figure 2

Table 2: Path probability of each alternative strategy

Alternative strategy and their path	Path probabilities (%)[1]
1.no intervention	
1.1 not infection, not disease[2]	99.92
1.2 infection, disease	0.08
1.2.1 OPD case	0.0726
1.2.2 IPD case	0.0074
2. vaccination without screening	
2.1 effective immunogenicity	96
2.2 not, susceptible	4
2.2.1 not infection	3.9968
2.2.2 infection, disease	0.0032
2.2.2.1 OPD case	0.0031
2.2.2.2 IPD case	0.0001
3. vaccination after screening	
3.1 have natural immunity	97.0
3.2 not, give vaccine	3.0
3.2.1 effective immunogenicity	2.88
3.2.2 not, susceptible	0.12
3.2.2.1 not infection	0.1104
3.2.2.2 infection, disease	0.0096
3.2.2.2.1 OPD case	0.0087
3.2.2.2.2 IPD case	0.0009

[1]The path probability for each consequence of particular action was calculated by multiplying the probabilities involved for each path; eg 0.08 % x 90.76 % = 0.0726 %, which would be the path probability for the item 1.2.1

[2] Here, "not infection" mean "not disease" in the category "Prevalence of infection in susceptible group" as presented in Table 1.

Figure 3

Table 3:Expected lost of each alternative strategy 1 .

Alternative strategies	Lost (baht)[2]
1. no intervention	
▫ For OPD Cases* (P = 0.0726)	106.48
▫ For IPD Cases** (P =0.0074)	138.13
Total cases	244.61
2. vaccination without screening	4.54
▫ For OPD Cases (P = 0.0031)	1.87
▫ For IPD Cases (P = 0.0001)	6.41
Total cases	12.76
3. vaccination after screening	16.80
▫ For OPD Cases (P = 0.0087)	29.56
▫ For IPD Cases (P = 0.0009)	
Total cases	

[1] as the model in 100 adults

[2] expected lost for each consequence of particular action was calculated by multiplying the probabilities involved for each path; eg 0.0074 x 18,666.67 = 138.13, which would be the path lost for the item "no intervention, For IPD cases"

* expected lost per OPD case equaled to 1466.67 baht (direct lost + indirect lost = 1000 + 466.67 baht)

** expected lost per IPD case equaled to 18,666.67 baht (direct lost + indirect lost = 15,400 + 3,266.67 baht)

Figure 4

Table 4: Cost - effectiveness analysis of each alternative strategy 1

Alternative strategies	Cost in performing of the strategy* (baht)	Expected lost (baht)	Total cost (baht)
1. no intervention	0	244.61	244.61
2. vaccination without screening	1,430	6.41	1,436.41
3. vaccination after screening	1,710	29.56	1,739.56

[1] as the model in 100 adults

* derived from the previous cost identification process

DISCUSSION

The hepatitis A virus (HAV), a picornavirus, is a common cause of hepatitis worldwide. Hepatitis A remains an important cause of community-acquired hepatitis in the United States and in the world. Spread of infection is generally person to person or by oral intake after fecal contamination of skin or mucous membranes; less commonly, there is fecal contamination of food or water. Hepatitis A is endemic in developing countries, and most residents are exposed in childhood. In contrast, the adult population in developed countries demonstrates falling rates of exposure with improvements in hygiene and sanitation (Cuthbert , 2001; Kemmer and Miskovsky, 2000).

After ingestion and uptake from the gastrointestinal tract, the virus replicates in the liver and is excreted into the bile. Cellular immune responses to the virus lead to destruction of infected hepatocytes with consequent development of symptoms and signs of disease. Acute hepatitis A infection is clinically indistinguishable from other causes of acute viral hepatitis. In young children the disease is often asymptomatic, whereas in older children, children and adults there may be a range of clinical manifestations from mild, an icteric infection to fulminant hepatic failure (Willner et al, 1998). Therapy remains supportive and prevention holds the key to elimination of widespread infection. However, luckily only a low infection rate among the susceptible case is detected.

Furthermore, acute infection can be prevented with inactivated, highly immunogenic vaccines.

Challenges for the future include strategies for broad-based population vaccination, including cost-effective approaches. The recommendations for hepatitis A vaccination are different due to the settings. Some indicated the effectiveness of the alternative “vaccination after screening”

(Chodick et al, 2001; Rajan et al ,2000), some indicated " vaccination without screening"(Jacobs et al, 2000). Therefore, specific approach for each setting is necessary.

In Thailand, hepatitis A infection is still an important viral infectious disease due to the poor sanitation in some area. A recent study indicated that up to 97.0 % of the Thai adults had natural immunity to this disease (Burke et al, 1996). However, there are also a considerable number of risk people, who have no immunity. Of interest, there has been no previous report concerning the cost and effectiveness of providing the hepatitis A vaccination to the Thai adults. Here, we reported the results from analysis of three alternative strategies in vaccinating the Thai adults.

Of interest, our results indicated that it is not cost effective to give the hepatitis A vaccination to the Thai adults at present. This trend is similar to the previous study among the Thai adolescents (Wiwanitkit et al, 2001, Soogarun et al, 2002). However, if the cost of the vaccine decrease, the repeat evaluation for each alternative strategy is needed for the new conclusion. The sensitivity analysis to determine the effect of a decrease in the cost of the vaccine is also recommended as the further study. In addition, benefit of a vaccine includes preventing deaths. A further cost benefit analysis determining how much it would cost to prevent one death from hepatitis A per year would be helpful when using the vaccine in adults prescreened, vaccinating only those without antibodies to hepatitis A.

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