ORIGINAL ARTICLE

Review of Hepatitis B Vaccination in Children of Workers of an Oil & Gas Industry in Lho'seumawe and Lho'sukon, North Aceh

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ABSTRACT We describe a retrospective study on hepatitis-B immunization in the Indonesian workers' children of Mobil-Oil Indonesia Lho' Seumawe and Lho'sukon, North Aceh. Data were obtained from medical records and included all children in the 0-15 years age group who had been immunized against hepatitis B. Types and schedules of vaccines, pre-immunization seromarkers, and anti HBsAb after the third immunization were recorded. For hundred and twenty children had received three doses of hepatitis B vaccines; 180 children had them at 0, 1 and 2 months and the rest at 0, 1 and 6 months. Type of vaccine used was human plasma derived vaccine with a dosage of 5 µg per shot. All of them (except the newborns) were tested and had seromarkers negative to hepatitis B infection prior to immunization. Testing for immune response (HBsAb) 2-6 months after the third immunization could only be done in 213 children, where 168 (78.9%) showed HBsAb titer > 10 mIU/ml, 5 (2,3%) had HBsAb < 10 mIU/ml, and the remaining 40 (18,8%) showed no seroconversion.Of those 40 children who did not seroconversed, 31 were given a fourth dose, and 14 children were retested for their HBsAb titre. Seven children had positive responses and the rest remained negative.[**Paediatr Indones 209-215**]

Introduction

Hepatitis is one of main health problems in the world. In USA, 60 000 cases are reported every year. Hepatitis B virus is one of the causes of hepatitis.[1] The incidence of hepatitis B infection in developed countries is 0.01 to 5% while in developing countries it is as high as 15%.[2] This disease spreads all over the world and occurs all the year, particularly in Africa and South East Asia, including Indonesia, with the prevalence of as high as 6-17%.[3]

Prevention of hepatitis B infection can be achieved by immunization and education.[4] Although the cost of hepatitis immunization is considered to be too expensive to most of Indonesian families,

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the immunization is certainly necessary. Hepatitis B immunization in Indonesian workers' children of MOI in Lho'seumawe, Lho'sukon, and Jakarta has been started since 1986. Hepatitis B immunization program in MOI, Lho'seumawe and Lho'sukon mainly included infants aged 0-1 year. Children 1-15 years old may be given immunization but they were not included in the program.

The purposes of this study were: (1) To detect the coverage of hepatitis B immunization of the years 1990, 1991, and 1992 in Indonesian workers' children of MOI in Lho'seumawe and Lho'sukon; and (2) To evaluate the formation of immune responses (seroconversions) after immunization with the 5 μg dose.

Methods

This was descriptive study conducted retrospectively. The study subjects consisted of children of Indonesian workers of MOI Lho'seumawe and Lho'sukon who were less than 15 years of age. Children included in this study were only those who had completed three 5 μg injections of hepatitis B vaccine in 1990, 1991 and 1992. Children immunized the years before were excluded from the evaluation of sero-conversion and HbsAb titers. The coverage of immunization was evaluated by the number of children less than 15 years old who had hepatitis B immunization of 1990, 1991 and 1992 or the years before. The efficacy of hepatitis B vaccination was measured by the results of serologic HBsAb (seroconversion) examinations and medical record reviews, whether or not those children have clinical hepatitis B after immunization. Before immunization, examination for hepatitis B markers (HBsAg, HBsAb, HBcAb) was conducted in those children, except newborn babies. Immunization was administered only if the results of examination for the three markers were negative. Newborn babies were not examined for the three markers and the first dose of hepatitis B vaccine was given immediately after birth. In addition to the hepatitis B vaccines, HBIg was given to those babies whose mothers showed positive HBsAg.

The vaccine used was Hevac B Pasteur (human plasma derived vaccine) with the dose of 5 μg, by IM injection in the antero-lateral thigh in babies and deltoid area in children. The potency of vaccines and the batch numbers were not determined or recorded before use.

In 1990, the schedule used was at the ages of 0, 1 and 2 months; in 1991, they were at the age of 0, 1 and 2 months, or 0, 1 and 6 months; and in 1992 at 0, 1 and 2 months for high risk children; or at 0, 1 and 6 months for low risk children. High and low risks were measured by the history of hepatitis B in their families. The evaluations of HBsAb titers were conducted using the Cobas Core anti-HBs (Direct) EIA method after 2 months of the last immunizations.

Results

The numbers of Indonesian workers' children under 15 years in Lho'seumawe and Lho'sukon in 1990, 1991, and 1992 were 1648, 1715, and 1700, respectively. See Table 1. The distribu-

Table 1. Age and sex distribution of Indonesian workers' children of MOI in Lho'seumawe and Lho'sukon in 1990, 1991, 1992

Age group (yr)	Number of children								
	1990			1991			1992		
	M	F	Total	M	F	Total	M	F	Total
0 -	44	51	95	27	42	69	34	40	74
1 -	243	243	486	222	238	460	196	215	411
5 -	315	304	619	344	313	657	332	316	648
10-15	211	237	448	243	286	529	276	291	567
Total	813	835	1648	836	879	1715	838	862	1700

Table 2. Coverage of hepatitis B immunization by age in 1990, 1991, and 1992

Age group (yr)	1990		1991		1992	
	No of children	Immunized	No of children	Immunized	No of children	Immunized
Program						
0 -	95	63 (66%)	69	61 (88%)	74	74 (100%)
Non-program						
1 -	486	11 (2%)	460	21 (5%)	411	50 (12%)
5 -	619	14 (2%)	657	33 (5%)	648	45 (7%)
10-15	448	14 (3%)	529	17 (3%)	567	17 (3%)

Table 3. Number children who had got hepatitis B immunizations by age and vaccination schedule in 1990 1991, and 1992

Age group (yr)	Immunization schedule (months)				
	1990	1991		1992	
	0, 1, 2	0, 1, 2	0, 1, 6	0, 1, 2	0, 1, 6
0 - 1	63	43	18	4	70
1 - 5	11	6	15	2	48
5 - 10	14	9	24	3	42
10 - 15	14	7	10	4	13
Total	102	65	67	13	173

Table 4. Results HBsAb examination after complete hepatitis B immunization in 1990, 1991 and 1992

Year	No of children	No of HBsAb examination	HBsAb concentration (mIU/ml)		
			Negative	<10	10+
1990	102	96	20	0	76 (79,2%)
1991	132	104	17	5	82 (78,9%)
1992	186	13	3	0	10 (77%)
Total	420	213	40 (18,8%)	5 (2,3%)	168 (78,9%)

Table 5. Distribution of children with negative HBsAb according to immunization schedule

Schedule	No	HBsAb negative result	
		No	%
0, 1, 2 mos	149	34	23
0, 1, 6 mos	64	6	9

Table 6. Results of HBsAb examinations in 14 seronegative children after a 4th hepatitis B immunization

Year	No of negative seroconversion	No of 4th immunization	No HBs Ab exam	HBsAb Concentration (mIU/ml)		
				Negative	< 10	10+
1990	20	17	12	7	0	5
1991	17	14	2	0	0	2
1992	3	0	0	0	0	0
Total	40	31	14	7(50%)	0	7(50%)

tion of immunized infants less than 1 year of age (who followed the immunization program) and those children more than 1 year of age (no program) is depicted in Table 2. It is clear that the coverage of infants who had immunization was much higher than that of children more than 1 year of age (Table 2). Table 2 also depicts that the coverage of immunization in infants was increasing, i.e., 63% in 1990, 88% in 1991, and 100% in 1992. This increase was less clear in children 1 year old or more.

Table 3 depicts the age distribution of children having different schedule of immunization. As expected, the proportion of children who had immunization schedule of in months 0, 1, and 6 were increasing.

The results of HBsAb examination are depicted in Table 4. It appears that seroconversion (defined as HBsAb 10 mIU /ml or more) was about the same, i.e. 79.2% (1990), 78.9% (1991), and 77% (1992). A closer look on the relation between immunization schedule and failure to seroconversion shows that the percentage of no seroconversion was much less (9%) in months 0, 1, 6 schedule compared with 23% in months 0,1,2 schedule. Re-immunization was done in 31 out of 40 children who failed to show seroconversion. Only 14 of the 31 children were evaluated; seven children still showed negative result, while in the other 7 children seroconversion was noted.

Discussion

Infection due to hepatitis B virus is unique, since this virus may result in acute and chronic liver diseases, and may even be cancer.[3,4] The age of patients at the onset of illness is important in determining whether or not it will be chronic; for example, if the infected case is a baby, the possibility to be chronic is higher than 90%. In case of children, only 20-30% may become chronic; while 5-10% of infected adults may develop chronic HBsAb.[5]

Our data show that the coverage of hepatitis B immunizations in Indonesian workers' infant of MOI in 1990, 1991 and 1992, were 66%, 88%, and 100%, respectively (Table 2). According to the WHO reports from 24 Western Pacific countries carrying out the hepatitis B immunizations programs, in more than half the coverage is 80%. No information is available for hepatitis B immunization coverage in Indonesia.

The reasons why not all have the immunization were positive HBsAg and HBsAb and because they were not attending the Clinic. Hepatitis B immunization program in MOI Lho'seumawe and Lho'sukon was directed to infants 0-1 year because of the relative high vaccine price, and prior studies have shown, that hepatitis B immunization to be more cost efficient in infants.

Those Indonesian workers' children of MOI in Lho'seumawe and Lho'sukon who had immune responses after complete hepatitis B immunization were 168 children (78,9%) (Table 4). This figure is lower than that of other reports.[6] We have no data to explain for certain this difference; however, the low dose of 5 μg used in our program, especially in older children, might have some influence on the negative response.

The number children who didn't give immune response (non responders) after complete hepatitis B immunization was more frequent in children with immunization schedule of 0, 1, 2, months (23%) than those of 0, 1, 6 months (9%) (Table 5). This finding supports other reports that the later schedule is more effectve than the first one. When non-responders were given the fourth injection, 50% showed positive respond.

We used the dose of 5 μg for all age group. The recommended dose for children is different from that of adults. A dose of 10 μg is recommended in children, and it is 20 μg in adults.[4,7] Nevertheless, several studies suggest that the lower than 10 μg dose in children is effective.[8]

The available hepatitis B vaccine is still expensive; nevertheless, the encouragement of vaccination program is necessary.[3] The high cost of vaccination makes its usage far from the expected target.[5] The Department of Health of Republic of Indonesia has only carried out the hepatitis B vaccination program in several provinces.[9] This needs the involvement of other parts. Besides government effort, public and private participations will play an important role. In Indonesia, many private companies may take part in it and they are responsible for the health and prosperity of the workers and their families. Mobil Oil Indonesia (MOI) is a private oil corporation that has carried out the basic immunization program plus hepatitis B immunization.[10]

In conclusion, we noted that (1) Hepatitis B immunization in MOI's Lho'seumawe and Lho'sukon has been carried out mainly in infants. (2) The coverage of hepatitis B immunization in Indonesian workers' children of MOI in infants 0-1 year of age is good; (3) Hepatitis B immunization with 5 μg in infants and children under 15 years of age gives approximately 80% seroconversion.

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