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Original Article

Status of Hepatitis B Immunization in Medical Stuffs at Children Medical Center Hospital-Tehran

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Abstract

Introduction:
Hepatitis B is a disease caused by the hepatitis B virus (HBV), which is transmitted through percutaneous (i.e., puncture through the skin) or mucosal (i.e., direct contact with mucous membranes) exposure to infectious blood or body fluids. HBV can cause chronic infection, resulting in cirrhosis of the liver, liver cancer, liver failure, and death. Persons with chronic infection also serve as the main reservoir for continued HBV transmission.

Material and Methods:
This is a prospective cross sectional study was performed in Children Medical Center Hospital on 396 medical personals (including 172 students, 92 interns, 56 residents and 56 fellowships) during September 2012 to October 2013.

Results:
All of medical staff had done HB vaccination. In 93% of them the vaccination was complete. The others, 16% had only one, and 84% had two dose injections. 73% didn't check HBsAb after vaccination. Results showed in 21.4% of fellowships, 42.8% of residents, non of interns and 35% of students, had checked HBsAb.

Conclusion:
Hepatitis B is a vaccine-preventable disease. HB is a serious world wide infection and medical staff are one of the most high risk groups. So Vaccinate their and HBS Antibody titer determination after complete vaccination is mandatory.

Keywords:
Immunization, Hepatitis B, Medical Staff, Vaccination.

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Introduction

Hepatitis B virus (HBV) is a serious public health problem worldwide and major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma (HCC). It was estimated that approximately 2 billion people have serological evidence of past or present HBV infection. More than 350 million are chronic carriers of HBV (1). Approximately 75% of chronic carriers live in Asia and the Western Pacific (2). It was reported that 15-40% of HBV infected patients would develop cirrhosis, liver failure, or HCC (3), and 500, 000 to 1.2 million people die of HBV infection annually (4,5). Because of the high HBV-related morbidity and mortality, the global disease burden of HB is substantial.

Epidemiology

The prevalence of chronic HBV infection varies greatly in different part of the world. The prevalence of chronic HBV infection worldwide could be categorized as high, intermediate and low endimicity. The age at the time of infection is associated with the endemicity of HBV infection (Table 1).

Table 1: Characteristics of endemic patterns of hepatitis B virus infection.

Characteristic	**Endemicity of infection**		
	Low (%)	Intermediate (%)	High (%)
Chronic infection prevalence	0.5-2	2-7	≥8
Past infection prevalence	5-7	10-60	70-95
Perinatal infection	Rare	Uncommon	Common
	(<10)	(10-60)	(>20)
Early childhood infection	Rare	Common	Very ommon
	(<10)	(10-60)	(>60)
Adolescent/adult infection	Very common	Common	Uncommon
	(70-90)	(20-50)	(10-20)

Source: Adapted from Ref (7).

The prevalence of HBV infection varies markedly throughout regions of the world (6). Hepatitis B is highly endemic in developing regions with large population such as South East Asia, China, sub-Saharan Africa and the Amazon Basin, where at least 8% of the population are HBV chronic carrier. In these areas, 70–95% of the population shows past or present serological evidence of HBV infection. Most infections occur during infancy or childhood. Since most infections in children are asymptomatic, there is little evidence of acute disease related to HBV, but the rates of chronic liver disease and liver cancer in adults are high (7).

Hepatitis B is moderately endemic in part of Eastern and Southern Europe, the Middle East, Japan, and part of South America. Between 10–60% of the population have evidence of infection, and 2-7% are chronic carriers. Acute disease related to HBV is common in these areas because many infections occur in adolescents and adults; however, the high rates of chronic infection are maintained mostly by infections occurring in infants and children (8). In these areas, mixed patterns of transmission exist, including infant, early childhood and adult transmission.

The endemicity of HBV is low in most developed areas, such as North America, Northern and Western Europe and Australia. In these regions, HBV infects 5–7% of the population, and only 0.5–2% of the population are chronic carriers (9). In these areas, most HBV infections occur in adolescents and young adults in relatively well-defined high-risk groups, including injection drug user, homosexual males, health care workers, patients who require regular blood transfusion or hemodialysis.

HBV Transmission

HBV is spread through contact with infected body fluids and the only natural

host is human. Blood is the most important vehicle for transmission, but other body fluids have also been implicated, including semen and saliva (10,11). Currently, three modes of HBV transmission have been recognized: perinatal, sexual & parenteral/ percutaneous transmission. There is no reliable evidence that airborne infections occur and feces are not a source of infection. HBV is not transmitted by contaminated food or water, insects or other vectors.

Perinatal Transmission

Transmission of HBV from carrier mothers to their babies can occur during the perinatal period, and appears to be the most important factor in determining the prevalence of the infection in high endemicity areas, particularly in China and Southeast Asia. Before HBV vaccine was integrated into the routine immunization program, the proportion of babies that become HBV carriers is about 10-30% for mothers who are HBsAg-positive but HBeAg-negative. However, the incidence of perinatal infection is even greater, around 70-90%, when the mother is both HBsAg-positive and HBeAg-positive (12,13). There are three possible routes of transmission of HBV from infected mothers to infants: transplacental transmission of HBV in utero; natal transmission during delivery; or postnatal transmission during care or through breast milk. Since transplacental transmission occurs antenatally, hepatitis B vaccine and HBIG cannot block this route. Epide-miological studies on HBV intrauterine infection in China showed that intrauterine infection occurs in 3.7-9.9% pregnancy women with positive HBsAg and in 9.8-17.39% with positive HBsAg/HBeAg (14-21) and it was suggested that a mother with positive HBeAg (OR=17.07) and a history of threatened premature labor (OR=5.44) are the main risk factors for intrauterine infection. The studies on transplacental transmission of HBV suggested two possible mechanisms (1) hemagenous route: a certain of factors, such as threaten abortion, can make the placental microvascular broken, thus the high-titer HBV maternal blood leak into fetus' circulation (20,22); (2) cellular transfer: the placental tissue is infected by high-titer of HBV in maternal blood from mother's side to fetus' step by step, and finally, HBV reach fetus' circulation through the villous capillary endothelial cells (14-18).

For neonates and children younger than 1 year who acquire HBV infection perinatally, the risk of the infection becoming chronic is 90% (23), presumably because neonates have an immature immune system. One of the possible reasons for the high rate of chronicity is that transplacental passage of HBeAg may induce immunological tolerance to HBV in fetus.

Sexual Transmission

Sexual transmission of hepatitis B is a major source of infection in all areas of the world, especially in the low endemic areas, such as North America. Hepatitis B is considered to be a sexually transmitted disease (STD). For a long time, homosexual men have been considered to be at the highest risk of infection due to sexual contact (70% of homosexual men were infected after 5 years of sexual activity) (24). However, heterosexual transmission accounts for an increasing proportion of HBV infections. In heterosexuals, factors associated with increased risk of HBV infection include duration of sexual activity, number of sexual partners, history of sexual transmitted disease, and positive serology for syphilis. Sexual partners of injection drug users, prostitutes, and clients of prostitutes are at particularly high risk for infection (25).

Parenteral/percutaneous Transmission

The parenteral transmission includes injection drug use, transfusions and dialysis, acupuncture, working in a health-care setting, tattooing and household contact. In the United States and Western Europe, injection drug use remains a very important mode of HBV transmission (23% of all patients) (6). Risk of acquiring infection increases with duration of injection drug use. Although the risk for transfusion-associate HBV infection has been greatly reduced since the screening of blood for HBV markers and the exclusion of donors who engage in high-risk activities, the transmission is still possible when the blood donors are asymptomatic carrier with HBsAg negative (26). Obvious sources of infection include HBV-contaminated blood and blood products, with contaminated surgical instruments and utensils being other possible hazards. Parenteral/percutaneous transmission can occur during surgery, after needle-stick injuries, intravenous drug use, and following procedures such as ear piercing, tattooing, acupuncture, circumcision and scarification. The nosocomial spread of HBV infection in the hospital, particularly in dialysis units, as well as in dental units, has been well described (6), even when infection control practices are followed. As with other modes of transmission, high vial titers have been related to an increased risk of transmission. People at high-risk of infection include those requiring frequent transfusions or hemodialysis, physicians, dentists, nurses and other healthcare workers, laboratory technicians, intravenous drug users, police, firemen, laundry workers and others who are likely to come into contact with potentially infected blood and blood products.

The risk of chronicity is low (less than 5%) for transmission through sexual contact, intravenous drug use, acupuncture, and transfusion (23). Individuals at risk for these transmission modes usually acquire HBV infection during adolescence or adulthood without immune tolerance. Instead, the disease progresses directly to the immune clearance phase and is of short duration, which probably accounts for high spontaneous recovery.

Prevention of HBV Infection

Three main strategies are available for the prevention of HBV infection: (1) behavior modification to prevent disease trans-mission, (2) passive immunoprophy laxis, and (3) active immunization.

Behavior Modification

Changes in sexual practice and improved screening measures of blood products have reduced the risk of transfusion-associated hepatitis. Behavior modification is thought be more beneficial in developed countries than in developing countries, where neonates and children in early childhood are at the greatest risk of acquiring infection. In these group, immunoprophylaxis, both passive and active, will be more effective.

Active Immunization

Prevention of primary infection by vaccination is an important strategy to decrease the risk of chronic HBV infection and its subsequent complications. The first-generation hepatitis B vaccine, an inactive plasma-derived vaccine, became available in 1982. Consequently, the second generation of HB vaccine, a DNA recombinant HB vaccine was also available for general use in 1986. Both of the vaccines were proven to be safe and efficacious in preventing HBV infection. In 1991, the World Health Organization (WHO) recommended that hepatitis B vaccination should be included in national immunization system in all countries with a hepatitis B carrier prevalence (HbsAg) of 8% or greater by 1995 and in all countries

by 1997. By May 2002, 154 countries had routine infant immunization with hepatitis B vaccine. WHO recommends that hepatitis B vaccine be included in routine immunization services in all countries. The primary objective of hepatitis B immunization is to prevent chronic HBV infections which result in chronic liver disease later in life. By preventing chronic HBV infections, the major reservoir for transmission of new infections is also reduced (Table 2) (27).

Table 2: Anti-HBs Seroconversion rates after hepatitis B vaccination (%).

Neonates	>95%
Age (years)	
2-19	~99%
20-29	~95%
30-39	~90%
40-49	~85%
50-59	~70%
>59	~50%
Renal failure, HIV infection, other immunosuppression	50-70%
Liver disease	60-70%

Material and Methods

This is a prospective cross sectional study in Children Medical Center Hospital on 396 medical personals (including 172 students, 92 interns,56 residents and 56 fellowships) during September 2012 to October 2013. We gathered the information from our questionnaires about HB vaccination number of vaccination and fallow up with HBS Ab that we had given to them. Data were
analyzed using SPSS version 16. P values less than 0.05 were considered significant.

Results

In 369 people, 180 were female and 204 were male. (12 cases didn't write their sex in our questionnaires).

All of medical staff had done HB vaccination. In 93% the vaccination was complete. The others,16% had only one and 84% had two dose injections. Results showed 73% of them didn't check HBsAb after vaccination. The duration time after vaccination was (0-3 years) in 64%, 3-5 years in 10% and more than 5 years in 26%. In the last group booster had been injected only in 14.7%. Results showed in 21.4% of fellowships, 42.8% of residents, non of interns and 35% of students, had checked HbsAb.

The vaccination was complete in 93% of fellowships, 93% of residents, 91% of interns and 96% of Students.

Discussion

Prevention of HBV infection thorough vaccination is still, therefore, the best strategy for decreasing the incidence of hepatitis B-associated cirrhosis and HCC. The vaccination should be done in 3 doses, and after that, antibody titre should be determined.

If the titre is above 100, there is no need for booster (28,29). If it is between 10 and 100, only one dose booster is needed (29,30) . The vaccine should be repeated in 3 doses f the antibody titre is below 10. The second three dose course is successful in 50-70%. Retesting for HBsAb is mandatory (29).

The vaccine complications are low (31). Our studies was done on almost 400 physicians or medical students. All had history of vaccination. In 93% its course was complete. Checking of HBsAb was done only in 26% and booster had been injected only in 22%. A similar study was done in Iran in 1380 in Bagiatallah Hospital on 500 physicians and there was only 74% history of vaccination that the most of them was among specialists (32).

Routine post – vaccination testing to document anti HBS seroconversion is unnecessary except in health care workers, patients on chronic homodialysis, bisexual men, spouses of carriers (33).

Test should be performed one to two months after vaccine completion except for infants born to HBsAg+ mothers in whom testing should be done at 9-15 months old (33).

Occupational health programs and others responsible for infection prevention and control should identify all staff whose work-related activities involve exposure to blood or other potentially infectious body fluids in a health-care, laboratory, public safety, or institutional setting (including employees, students, contractors, attending clinicians, emergency medical technicians, paramedics, and volunteers); provide education to staff to encourage vaccination; and implement active follow-up, with reminders to track completion of the vaccine series and postvaccination testing among persons receiving vaccination (34).

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References

1. Hepatitis B: World Health Organization Fact Sheet 204. 2000: World Health Organization. http://www.who.int/ mediacentre/ factsheets/ fs204/en/.
2. Gust ID. Epidemiology of hepatitis B infection in the Western Pacific and South East Asia. Gut 1996; 38(suppl 2):S18-S23.
3. Lok AS. Chronic hepatitis B. N Engl J Med 2002; 346:1682-3.
4. Mahoney FJ. Update on diagnosis, management, and prevention of hepatitis B virus infection. Clin Microbiol Rev 1999;12:351-66.
5. Lee WM. Hepatitis B infection. N Engl J Med 1997; 337:1733-45.
6. Margolis HS, Alter MJ, Hadler SC. Hepatitis B: evolving epidemiology and implications for control. Semin Liver Dis 1991;11:84-92.
7. Alter M. Epidemiology of hepatitis B in Europe and worldwide. J Hepatol 2003; 39: S64-S9.
8. Toukan A. Strategy for the control of hepatitis B virus infection in the Middle East and North Africa. Vaccine 1990;8(suppl):S117-S21.
9. McQuillan GM, Townsend TR, Fields HA, Carroll M, Leahy M, Polk BF. Seroepidemiology of hepatitis B virus infection in the United States. Am J Med 1989;87(suppl 3A): 5S-10S.
10. Scott RM, Snitbhan R, Bancroft WH, Alter HJ, Tingpalapong M. Experimental transmission of hepatitis B virus by semen and saliva. J Infect Dis 1980;142: 67-71.
11. Bancroft WH, Snitbhan R, Scott RM, Tingpalapong M, Watson WT, Tanticharoenyos P. et al. Transmission of hepatitis B virus to gibbons by exposure to human saliva containing hepatitis B surface antigen. J Infect Dis 1977; 135:79-85.
12. Sevens CE, Neurath RA, Beasly RP, Szmuness W. HBeAg and anti-HBe detection by radioimmunoassay. Correlation with vertical transmission of hepatitis B virus in Taiwan. J Med Virol 1979; 3:237-41.
13. Xu ZY, Liu CB, Francis DP, Purcell RH, Gun ZL, Duan SC. et al. Prevention of perinatal acquisition of hepatitis B virus carriage using vaccine: preliminary report of a random double-blind placebo-controlled and comparative trail. Pediatrics 1985 ;76:713-18.
14. Xu D, Yan Y, Xu J, Wang W, Men K, Zhang J, Liu B. et al. A molecular epidemiology study on risk factors and mechanism of HBV intrauterine transmission. Natl J Med China 1999; 79:24-7.
15. Yan Y, Xu D, Wang W, Liu B, Liu Z, Men K. et al. The role of placenta in hepatitis B virus intrauterine transmission. Chin J Obstet Gynecol 1999 ;34:392-5.
16. Xu D, Yan Y, Choi BC, Xu J, Men K, Zhang J. et al. Risk factors and mechanism of transplacental transmission of hepatitis B virus: a case-control study. J Med Virol 2002;67:20-6.
17. Xu D, Yan Y, Zou S, Choi BC, Wang S, Liu P. et al. Role of placental tissues in the intrauterine transmission of hepatitis B virus. Am J Obstet Gynecol 2001;185:981-7.
18. Xu D, Yan Y, Xu J, Men K, Liu Z, Zhang J. et al. A molecular epidemiologic study on the mechanism of intrauterine transmission of hepatitis B virus. Chin J Epidemiol 1998; 19: 131-3.

19. Wang S, Xu D, Yan Y, Shi M, Zhang J, Ma J. et al. An investigation on the risk factors of the intrauterine transmission of hepatitis B virus. Chin J Public Health 1999;18:251-2.
20. Lin H, Lee T, Chen D, Sung JL, Ohto H, Etoh T. et al. Transplacental leakage of HBeAg positive maternal blood as the most likely route in causing intrauterine infection with hepatitis B virus. J Pediatr 1987;111:877-81.
21. Wang Z, Zhang J, Yang H, Li X, Wen S, Guo Y. et al. Quantitative analysis of HBV DNA level and HBeAg titer in hepatitis B surface antigen positive mothers and their babies: HBeAg passage through the placenta and the rate of decay in babies. J Med Virol 2003; 71: 360-6.
22. Ohto H, Lin H, Kawana T, Etoh T, Tohysma H. Intrauterine transmission of hepatitis B virus is closely related to placental leakage. J Med Virol 1987;21:1-6.
23. Hyams KC. Risks of chronicity following acute hepatitis B virus infection: a review. Clin Infect Dis 1995;20: 992-1000.
24. Alter MJ. Epidemiology and prevention of hepatitis B. Semin Liver Dis 2003; 23:39-46.
25. Alter M, Mast E. The epidemiology of viral hepatitis in the United States. Gastroenterol Clin North Am 1994; 23:437-40.
26. Luo KX, Liang ZS, Yang SC, Zhou R, Meng QH, Zhu YW. et al. Etiological investigation of acute post-transfusion non-A, non-B hepatitis in China. J Med Virol 1993; 39:219-23.
27. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. J Viral Hepat 2004;11: 97-107.
28. Hepatitis B virus and Hepatitis delta virus. In: sheila sherlock S James Dooley(eds). Diseases of the liner and Biliary system. Eleventh ed. Blackwell publishing 2002:290-4.
29. Mast EE, williams IT, Alter MJ, Margolis HS. Hepatitis B vaccination of adolescent and adult high- risk groups in the United State. Vaccine 1998;16suppl: 527.
30. Maureen. M. Jonas MD. Viral Hepatitis: in walker WA, Durie PR, Hamilton JR(eds): pediatric Gastrointestinal Disease third .BC Decker comp. Boston 2000: 941- 946.
31. Zajac BA, west DJ, Mc Aleer WJ, Scolncke EM. Overview of clinical studies with HB vaccine made by recombinant DNA.J Inf Dis 1986; 13:39-34.
32. Alavian SM, Hatami S. A study on HB vaccination and its related factors in physicians in Tehran, Bagiatallah Hospital in: Book of congress of hepatitis, prevention and treatment 1380 P: 59.
33. Eng-Kiang T, Anna SEF. Hepatitis B virus vaccination. UP To Date 2005; 13 (2):(800)998-6374.(781)237-4788.
34. CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. MMWR 2001; 50 (No. RR-11).