4. Viral diseases

Hepatitis B virus infection*

1. Brief description of the condition/disease

Hepatitis B virus (HBV) is transmitted through percutaneous or permucosal exposure to blood or body fluids, producing an acute or chronic infection. Most acute infections are asymptomatic. Fewer than 10% of children and 33% of adults have acute hepatitis B, which often results in hospitalization and — in approximately 0.1% of patients — in acute hepatic failure and death. HBV regularly produces chronic infection in infants (90%) and young children (30–60%) and, less frequently (1–6%), in older children, adolescents, and adults. Among adults, chronic HBV infection can cause death from chronic liver disease (CLD, e.g. cirrhosis) or primary hepatocellular carcinoma (PHC). The risk for a liver-disease-associated death among persons with chronic HBV infection is 25% for those who acquired infection as an infant or young child, and 15% for those who acquired infection as an adolescent or adult. HBV infection also can produce extrahepatic manifestations, including polyarteritis nodosa and membrano-proliferative glomerulonephritis.

The prevalence of chronic HBV infection varies worldwide; it is highly endemic (>8% prevalence) in Africa, the Pacific Islands, parts of South America, and most of Asia, as well as in ethnically defined populations in Australia, New Zealand, and the USA. The high prevalence of infection is sustained by transmission during the perinatal period and early childhood. In populations with intermediate endemicity (2–8% prevalence), perinatal and early childhood transmission accounts for most HBV infection. Endemicity is low (<2% prevalence) in Australia, New Zealand, Western Europe, and the USA. Most acute infections occur among adolescents and adults, but perinatal and early childhood infections contribute substantially to the prevalence of chronic infection, and populations in which HBV infection is highly endemic may reside in these areas.

2. Current burden and rating within the overall burden of disease

Estimates derived from regional data on prevalence of infection in the general population indicate that 360 million people worldwide have chronic HBV infection: 78% in Asia; 16% in Africa; 3% in South America, and 3% in Europe, North America and Oceania combined. Of these 360 million HBV-infected people, 55–92 million (15–25%) are expected to die at 45–55 years of age from HBV-related CLD. An estimated 1 million people die annually from HBV-related CLD or PHC. Although etiology-specific death rates for CLD are not available in most countries, CLD or PHC is among the five leading causes of death among adults in many developing countries. In countries in which HBV infection is highly endemic, most CLD is HBV-related; in countries in which endemicity is low, such as the USA, 10–15% of CLD is HBV-related.

3. Feasibility (biological) of elimination/eradication

Immunization with plasma-derived or recombinant hepatitis B vaccine confers a high level of protection against acute and chronic infection. Pre-exposure vaccination prevents >95% of infections, and postexposure vaccination of infants at risk for perinatal infection prevents 90–95% of infections. The initial vaccination series confers protection against chronic infection for at least 15 years, and HBV transmission has been eliminated in populations 10 years after introduction of routine infant vaccination. Most chronically infected persons remain so over their lifetime, but their potential infectivity decreases because of the decline in HBV titre (HB_eAg-positivity). The combined effects of immunization and declining infectivity make elimination of HBV infection feasible. Eradication of HBV infection requires sustained elimination of transmission over the number of years needed for persons with chronic infection to be no longer in the population. The increased use of effective antiviral

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agents to treat chronic HBV infection could hasten its elimination.

Humans are the only known host for HBV Although experimental infection can be produced in some great apes. they do not appear to be a reservoir Variants of HBV have been described which appear resistant to vaccine-induced antibody. However, failure of pre-exposure vaccination caused by these variants has not been demonstrated.

4. Estimated costs and benefits of elimination/eradication

Economic analyses have shown routine infant vaccination to be cost-effective in preventing the acute and chronic sequelae of HBV infection in populations in which endemic HBV infection is high or low. In China (Province of Taiwan) the rate of chronic HBV infection and PHC deaths decreased among children within 10 years of a sustained infant hepatitis B vaccination programme. However. because the costs of HBV-related CLD will occur many years in the future, some analyses have not found vaccination to be cost-saving or cost-effective. The economic effects of vaccination programmes to eliminate HBV transmission in populations with differing rates of infection have not been examined.

5. Key strategies to accomplish the objectives

The basic strategy to eliminate HBV transmission is to integrate hepatitis B vaccine into the routine infant vaccination schedule in a manner that will prevent perinatal and early childhood infection. In populations in which endemic HBV infection is high or intermediate, this generally requires beginning routine vaccination at birth to prevent perinatal transmission. However, using maternal HB_sAg screening, any country with the appropriate infrastructure could identify infants who require post-exposure vaccination soon after birth and routinely vaccinate all other infants. In countries in which the endemicity of HBV infection is intermediate or low. routine infant vaccination will prevent transmission among adolescents and adults after several decades. Elimination of transmission can be accelerated through catch-up vaccination of young children. adolescents. and high-risk adults.

6. Research needs

Country-specific data are needed on HBV infection and the burden of HBV-related disease. development of combination childhood vaccines that include hepatitis B continued studies to determine the long-term efficacy of infant immunization and the need for booster doses of vaccine. population-based studies of the effectiveness of various vaccination strategies. possible effects of antibody-resistant variants of HBV in elimination of transmission. and the potential for HBV circulation in susceptible animals.

7. Status of elimination/eradication efforts to date

The World Health Assembly has recommended that all countries integrate hepatitis B vaccine into childhood (infant or. where appropriate, adolescent) vaccination schedules by 1997. Thus far, approximately 95 countries have included or are in the process of including hepatitis B vaccine in their childhood vaccination schedules. Population-based evaluation projects (e.g. in China (Province of Taiwan), the Gambia. Shanghai. and Alaska) have been developed to evaluate the effectiveness of various vaccination strategies. and in some, transmission has been eliminated

8. Principle challenges to elimination/eradication

HBV is the first chronic infection considered for elimination/eradication The principle challenges are to eliminate transmission and to maintain elimination for many decades. The primary barrier to elimination of HBV transmission is the cost of hepatitis B vaccine, especially for developing countries. Although the vaccine became available in the early 1980s. the cost appears to be higher relative to other childhood vaccines because it is a new vaccine produced with new technology. Other barriers include lack of knowledge about the relation between chronic HBV infection. CLD, and PHC; lack of local information on the HBV-related disease burden; and continued perception that because HBV-related CLD and PHC occur among adults, prevention of HBV infection is not an appropriate childhood vaccination activity. especially in countries where the endemicity is low.