Hepatitis B Status in Vaccinated, Incompletely Vaccinated and Unvaccinated Children

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Abstract

In our study, we will evaluate the immune status of HB virus in cohort of 100 children (Fully vaccinated, partially vaccinated and unvaccinated) aged from 1 to 18 years and asking about: Age, If the doses of HB vaccine completed or not, The interval between doses, Any complications after vaccination and Is there is any symptoms or sings of HB virus in unvaccinated children?.

The consequences of failed or incomplete vaccination will be also evaluated in our study in an attempt to recommend therapy for chronic HBV infection.

Key words: immune status - HB virus - Fully vaccinated, partially vaccinated and unvaccinated

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Dedication

This work is dedicated to the individuals who have given meaning to my life;

To my parents, who gave me everything and took nothing.

To my Prof. Mortada Hassan El-Shabrawi, who supported me, encouraged me to do this work.

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List of Abbreviations

ADV	Adefovir
AFP	Alpha Fetoprotein
ALT	Alanine Aminotransferase
AST	Aspartate Aminotransferase
BCG	Bacillus Calmette-Guérin
bDNA	branched DNA hybridization
cccDNA	covalently closed circular DNA
CDC	Center for Disease Control and prevention
CLD	Chronic Liver Disease
DNA PCR	DNA Polymerase Chain Reaction
DNAp	DNA Polymerase
DTP-OPV	Diphtheria, Tetanus, Pertussis and Oral Polio Vaccine
EPI	Expanded Program on immunization
FDA	Food and Drug Administration
Fig	Figure
HBcAb	Hepatitis B core Antibodies
HBcAg	HBc Antigen
HBeAb	HBe (envelope) Antibodies
HBeAg	HBe Antigen
HBIG	Hepatitis B Immune Globulin
HBsAb	Hepatitis B surface Antibodies
HBsAg	Hepatitis B surface protein(s) or Antigen
HBsAg	Hepatitis B surface Antigen
HBV	Hepatitis B Virus
HBV DNA	Deoxy Ribo Nucleic Acid of HBV
HCC	Hepatocellular Carcinoma
HCV	Hepatitis C Virus

IFN-α	Interferon-alpha
IFN-γ	Interferon-gamma
IgG	Immunoglobulin G
IgM	Immunoglobulin M
LMV	Lamivudine
NIH	National Institutes of Health
PCR	Polymerase Chain Reaction
Peg-IFN	Pegylated Interferon
TNF-α	Tumor Necrosis factor-alpha
WHO	World Health Organization

Introduction

Childhood hepatitis B virus (HBV) infection is an international health problem, and transmission from mother to infant is a major route of acquisition throughout the world. Infections acquired in childhood are responsible for the largest majority of chronic HBV infection, with its attendant complications of cirrhosis and hepatocellular carcinoma (HCC) ***(Vogt et al., 2004).***

Interruption of childhood HBV infection has a large impact on the prevalence of chronic HBV infection and its sequelae. It is necessary to understand the differences in epidemiology, natural history, clinical features, indications for treatment, and rationale for immunoprophylaxsis between children and adults. Because of immunization and other programs, the annual incidence of new cases in the United States has decreased by more than 50% over the last decade ***(McQuillan et al., 2002).***

Every year between 10 and 30 million people worldwide are infected with HBV many are children and teens. When newborns and young children are infected their immune systems often fail to recognize and vanquish the virus. As a result about 90% of babies will develop a chronic or long-term infection. According to the World Health Organization (WHO) estimates HBV infection kills 1.3 to 1.5 million children and adults worldwide each year ***(Thio and Robert 2003).***

The hepatitis B virus is 100 times more infectious than the AIDS virus. Yet, hepatitis B can be prevented with a safe and effective vaccine. For the 400 million people worldwide who are chronically infected with hepatitis B the vaccine is of no use. However, there are promising new treatments for those who live with chronic hepatitis B ***(Vogt et al., 2004).***

Aim of Work

To assess the prevalence of Hepatitis B virus infection, antibody persistence and protection from hepatitis B virus (HBV) infection after primary HBV vaccination of healthy normal children.

Identification of the Hepatitis B Virus

Until World War II, doctors did not even know that several types of viral hepatitis excited, nor did they know how the infection is transmitted. A British physician, who is specialized in liver disorders **Dr.F.O.MacCallum**, identified the HBV when he was researching a yellow fever vaccine during **1940**. **Dr.MacCallum** discovered that many British soldiers who received Yellow fever vaccine developed hepatitis a few months later; at that time the Yellow fever vaccine was made from human serum (blood). He deduced that a form of viral hepatitis was transmitted by blood after he tracked hepatitis outbreaks in patients who were subjected to reused syringes. He called the disease transmitted by contaminated blood hepatitis B or serum Hepatitis (**Harlod and Margolis., 1998).**

In **1963**, **Dr Baruch Blumberg**, who was studying hemophilia at the National Institute of Health (NIH), discovered an antigen, identified as hepatitis B surface antigen, and it was found in patients suffered from hepatitis and was initially called Australian Antigen. **Dr Blumberg** developed a test that identified hepatitis B viruses in blood samples. In **1971**, the test became the first method for screening blood donations for the virus **(Hepatitis B Foundation., 2000).**

Together **Blumberg** and **Millman** developed a vaccine against hepatitis B and won a Nobel Prize for medicine in 1976 in recognition of their achievement **(CDC 2001b).**

The Hepatitis B Virus

Hepatitis B virus is the prototype member of the family hepadnaviridae that can be divided into the orthohepadnaviruses of mammals and the avihepadnaviruses of birds. To date, the orthohepadnaviruses are found only in humans and primates. Primate HBV were found in old world primates like chimpanzees, gorillas, gibbons and in one new world primate, the woolly monkey (**Schaefer., 2007)**. The avian hepatitis B viruses are important as an animal model for the understanding of the life cycle of hepadnaviridae (**Funk., 2007).**

The hepatitis B virus is a 42 nm partially double stranded DNA virus, composed of a 27 nm nucleocapsid core (HBcAg), surrounded by an outer lipoprotein coat (also called envelope) containing the surface antigen (HBsAg) **(Ganem et al., 2001).**

Three morphological forms can be seen on electron microscopy: double-shelled spheres (intact virions), smaller spherical particles, and tubular structures. The outer surface of the intact virion is composed of viral envelope protein or surface antigen (HBsAg). The internal part of the virion consists of a nucleocapsid; composed of two proteins, the core antigen (HBcAg) and the e-antigen (HBeAg) that surrounds the genome **(Fig 1) (Akarca and Lok., 1995), (Lok et al., 2001).**

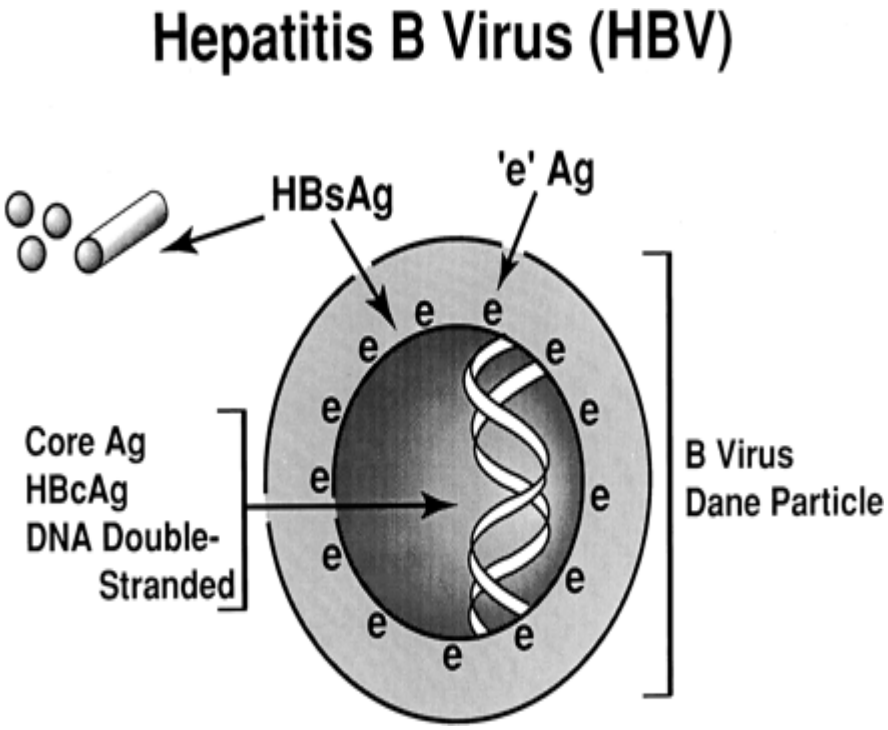

Fig 1: The hepatitis B virus

The smaller spherical particles and tubular structures are composed of excess HBsAg and may outnumber the intact virions by a factor of 100 to 1000. The infectious virion has an incomplete (partially single stranded), open circular DNA genome of 3200 base pairs (3.2 kb), comprising four genes: S (that encodes the envelope or surface antigen), C (that encodes the core protein and e-antigen), P (that encodes a DNA polymerase that also has reverse transcriptase activity), and X (a transactivating protein that can enhance the replication of HBV as well as HIV and that appears to be more frequently expressed in patients with severe liver disease and Hepatocellular carcinoma, in clinical practice, this viral protein is of limited relevance or application) **(Lok et al., 2001).**

Although the genome is small, it can produce these four large proteins because the genes overlap. For example, the S gene overlaps the