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Hepatitis B Virus

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Abstract: HepatitisB constitutes a vaccine-avertable hepatic affliction precipitated by the hepatitis B virus (HBV). The dissemination of Hepatitis B occurs upon the intrusion of blood, semen, or alternative bodily fluids from an HBV-infected individual into the system of an uninfected individual. Such transmission avenues encompass sexual intercourse, needle exchange, or perinatal transmission. While not universal, symptomatic manifestation among recent HBV infectees may encompass fatigue, anorexia, abdominal discomfort, emesis, and icterus.

Keywords: hepatitis B, needle sharing, syringes, injection paraphernalia.

For numerous individuals, hepatitis B represents an acute ailment. Conversely, for others, it may evolve into a protracted, persistent infection predisposing to severe, potentially life-threatening medical complications such as cirrhosis or hepatocellular carcinoma. The likelihood of chronic infection is correlated with the age of onset: roughly 90% of neonates acquiring hepatitis B progress to chronic infection, whereas merely 2%–6% of adults acquiring the virus develop chronicity. Optimal prevention of hepatitis B entails vaccination. In the United Kingdom, hepatitis B immunization is administered to infants as part of the 6-in-1 vaccine series. Additionally, neonates born to hepatitis B-positive mothers receive supplementary vaccinations at birth, 4 weeks, and 1 year, thereby mitigating their susceptibility to contracting the infection.

Adults only necessitate vaccination if they are at heightened risk, such as:

• Travelling to regions of elevated risk necessitates consideration of hepatitis B vaccination, albeit individuals might incur expenses for such immunization.

• Preexisting liver or renal ailments warrant vaccination.

• HIV-positive status mandates vaccination.

• Occupations entailing elevated infection risk, e.g., healthcare personnel or prison staff, necessitate vaccination, with the onus typically falling on the employer to facilitate vaccination arrangements for at-risk employees.

Before embarking on international travel, it is advisable to seek counsel from a travel clinic, general practitioner, nurse, or pharmacist. Hepatitis B stands as the prevailing serious hepatic ailment globally, stemming from the hepatitis B virus's assault on hepatic tissues. Approximately two billion individuals (equivalent to 1 in 3) have encountered the infection, with an estimated 300 million individuals harboring chronic hepatitis B. Annually, up to 1 million fatalities occur due to hepatitis B, notwithstanding its preventability and manageability.

Hepatitis B dissemination occurs via direct exposure to contaminated blood or specific bodily fluids. Primarily, vertical transmission arises during childbirth, facilitated by maternal-fetal blood interchange. Additionally, transmission transpires through unsterilized medical or dental apparatus, unprotected sexual intercourse, unsterile needle use, or communal use of personal items like razors, toothbrushes, nail clippers, and body adornments. Characterized as a "silent epidemic," hepatitis B frequently remains asymptomatic upon recent or chronic infection, enabling inadvertent viral propagation and perpetuating the covert dissemination of the virus. Despite absence of symptoms in chronically infected individuals, ongoing hepatic injury may precipitate grave liver pathologies, including cirrhosis or hepatocellular carcinoma.

Encouragingly, hepatitis B is both preventable and manageable. Diagnosis of hepatitis B necessitates a straightforward blood assay, serving as the sole definitive method to ascertain infection status. A safe and efficacious vaccine exists for hepatitis B prevention. Moreover, robust pharmaceutical interventions effectively control chronic hepatitis B infections, with the prospect of achieving a curative outcome looming on the horizon.

Hepatitis B and your liver

The liver, an indispensable organ, dictates human survival, as a complete shutdown results in imminent demise within one to two days, given its pivotal role in bodily functions. Remarkably, liver function endures even with up to 80% diseased or excised tissue, owing to its remarkable regenerative capacity facilitated by residual healthy hepatocytes. Analogously, the liver serves as the engine in the human body, orchestrating myriad essential tasks to ensure optimal physiological functioning. These include vitamin, sugar, and iron storage for energy provision, regulation of cholesterol levels, detoxification of blood, synthesis of clotting factors for hemostasis, production of immune mediators to combat infections, and secretion of bile to aid digestion and nutrient absorption.

The term "hepatitis" denotes hepatic inflammation, hence "hepatitis B" signifies liver inflammation instigated by the hepatitis B virus. Timely detection coupled with appropriate medical oversight enables individuals afflicted with chronic hepatitis B to anticipate a prolonged and healthful lifespan. Hepatitis B Virus Overview: The hepatitis B virus, a diminutive DNA virus, pertains to the Hepadnaviridae family. Analogous viruses within this taxonomic group are also prevalent in woodchucks, ground squirrels, tree squirrels, Peking ducks, and herons. Hepatitis B Virus Structure: Structurally, the hepatitis B virus comprises an external envelope and an internal core.

The viral exterior envelope consists of a surface glycoprotein termed the hepatitis B surface antigen (HBsAg). Detection of HBsAg via a straightforward blood assay confirms hepatitis B virus infection in individuals. Conversely, the viral interior encompasses a proteinaceous capsid known as the hepatitis B core antigen (HBcAg), housing the viral DNA and replication enzymes.

The Life Cycle of Hepatitis B Virus:

The hepatitis B virus (HBV) undergoes a multifaceted life cycle. Initially, the virus penetrates the hepatocyte host cell and translocates into the hepatocyte nucleus. Upon nuclear entry, viral DNA undergoes conversion into covalently closed circular DNA (cccDNA), serving as a blueprint for viral replication, thereby generating new hepatitis B virus progeny. The newly synthesized HBV particles are encapsulated and egress from the hepatocyte, while the persistent viral cccDNA remains within the nucleus, facilitating potential integration into the host hepatocyte DNA and perpetuation of viral replication. Although not fully elucidated, certain stages of this replicative cascade are prone to errors, contributing to the diverse genotypes or genetic variations observed in the hepatitis B virus.

HBV transmission occurs via activities entailing percutaneous (i.e., skin-penetrating) or mucosal contact with infected blood or bodily fluids (e.g., semen and saliva), including:

- Injection drug usage involving needle, syringe, or drug-preparation paraphernalia sharing.

- Perinatal transmission from an HBV-positive individual during childbirth.

- Direct contact with the blood or open wounds of an HBV-infected individual.

- Accidental needlestick injuries or exposure to sharp implements.

- Sharing of select items with an HBV-infected individual capable of breaching the skin or mucosal membranes (e.g., razors, toothbrushes, and glucose monitoring devices), potentially leading to blood exposure.

In regions of high endemicity, hepatitis B primarily disseminates through perinatal transmission from mother to child at birth or via horizontal transmission, notably from an infected child to an uninfected peer during the initial five years of life. Infants infected perinatally or before age five frequently progress to chronic infection. Additionally, hepatitis B spreads through needlestick injuries, tattooing, piercing, and exposure to infected blood and bodily fluids, including saliva, menstrual, vaginal, and seminal secretions. Viral transmission may also ensue through the reuse of contaminated needles, syringes, or sharp implements, either in healthcare settings, community settings, or among individuals engaging in injection drug use. Sexual transmission is more prevalent among unvaccinated individuals with multiple sexual partners.

Acquisition of hepatitis B infection during adulthood precipitates chronic hepatitis in fewer than 5% of instances, while infection during infancy and early childhood yields chronic hepatitis in approximately 95% of cases. This underscores the imperative of fortifying and prioritizing vaccination during infancy and childhood. Hepatitis B virus viability outside the body extends to at least 7 days, during which it retains infectious potential if introduced into the body of an unvaccinated individual. The incubation period for hepatitis B spans 30 to 180 days, with viral detection feasible within 30 to 60 days post-infection. Persistence and progression to chronic hepatitis B are more likely, especially following transmission during infancy or early childhood.

Symptoms

The majority of individuals remain asymptomatic upon recent infection, while others manifest acute symptoms lasting several weeks, encompassing jaundice, dark urine, profound fatigue, nausea, vomiting, and abdominal discomfort. Acute hepatitis may progress to acute liver failure, culminating in fatality. Among the chronic sequelae of HBV infections, a subset develops advanced hepatic pathologies such as cirrhosis and hepatocellular carcinoma, leading to substantial morbidity and mortality. Specific therapeutic modalities for acute hepatitis B are lacking, thus management focuses on palliative measures and maintenance of nutritional equilibrium, including rehydration to offset fluid losses from emesis and diarrhea. Paramount is the avoidance of unnecessary pharmacological interventions.Acetaminophen, paracetamol, and antiemetic medications should be abstained from. Chronic hepatitis B infection can be managed pharmacologically, including administration of oral antiviral agents. Treatment aims to decelerate cirrhosis progression, diminish liver cancer incidence, and enhance long-term survival. In 2021, the World Health Organization (WHO) projected that 12% to 25% of individuals with chronic hepatitis B infection would necessitate treatment, contingent upon the context and eligibility criteria. WHO advocates for the utilization of oral therapies (tenofovir or entecavir) as the most potent agents for hepatitis B virus suppression. Initiation of hepatitis B treatment typically necessitates lifelong continuation. In resource-limited settings, individuals with liver cancer often succumb within months of diagnosis. Conversely, in affluent nations, timely hospital presentation facilitates access to surgical and chemotherapeutic interventions, which may extend life expectancy by several months to a few years. Liver transplantation is occasionally warranted for individuals with cirrhosis or liver cancer in high-income countries, albeit outcomes vary.

Prevention: The World Health Organization (WHO) advocates for universal administration of the hepatitis B vaccine to all neonates promptly after birth, ideally within a 24-hour window, supplemented by 2 or 3 subsequent doses administered at intervals of no less than 4 weeks to ensure completion of the vaccination regimen. Immunization confers protection for a minimum of 20 years and is likely to confer lifelong immunity. WHO does not endorse booster vaccinations for individuals who have completed the 3-dose vaccination regimen. Furthermore, aside from neonatal immunization, WHO recommends the utilization of antiviral prophylaxis to mitigate mother-to-child hepatitis B transmission. Adoption of blood safety measures and adoption of safer sexual practices, such as limiting the number of sexual partners and employing barrier methods (e.g., condoms), also serve as effective transmission prevention strategies.

WHO Initiative: In May 2016, the World Health Assembly endorsed the inaugural Global Health Sector Strategy on Viral Hepatitis, spanning 2016–2020. This strategy underscored the pivotal role of universal health coverage and delineated targets congruent with those of the Sustainable Development Goals. The strategy articulated aspirations for viral hepatitis eradication as a public health menace by 2030, defined by a 90% reduction in new chronic infections and a 65% reduction in mortality compared to the 2015 baseline. It also delineated a roadmap towards eradication by implementing pivotal prevention, diagnosis, treatment, and community intervention strategies. In May 2022, the 75th World Health Assembly acknowledged a fresh set of integrated global health sector strategies spanning HIV, viral hepatitis, and sexually transmitted infections for the 2022–2030 period. Building upon prior and current strategies, numerous Member States have devised comprehensive national hepatitis programs and elimination strategies guided by the global health sector strategy.

To facilitate nations in attaining the global hepatitis elimination objectives within the Sustainable Development Agenda 2030, WHO is endeavoring to:

- Enhance awareness, foster collaborations, and galvanize resource mobilization.

- Develop evidence-informed policies and actionable data.

- Enhance health equity in the hepatitis response.

- Implement transmission prevention measures.

- Expand the scope of screening, care, and treatment services.

The World Health Organization orchestrates the yearly World Hepatitis Day initiative (as one of its nine principal annual health campaigns) with the aim of augmenting awareness and comprehension of viral hepatitis. For World Hepatitis Day 2022, WHO centers its attention on the theme "Enhancing Proximity of Hepatitis Care" and advocates for streamlined provision of viral hepatitis services, thereby fostering closer access to care within communities.

HBV-HIV Coinfection.

Approximately 1% of individuals harboring HBV infection (equivalent to 2.7 million people) concurrently exhibit HIV infection. Conversely, the worldwide prevalence of HBV infection among HIV-positive individuals stands at 7.4%. Since 2015, the World Health Organization (WHO) has advocated for universal treatment initiation for all individuals diagnosed with HIV infection, irrespective of disease progression stage. Tenofovir, integral to the first-line therapeutic regimens for HIV infection, also exhibits efficacy against HBV.

Diagnosis: Clinical differentiation between hepatitis B and viral hepatitides stemming from alternative etiologies remains unattainable, thus necessitating laboratory confirmation for accurate diagnosis. Various serological assays are available to diagnose and monitor individuals afflicted with hepatitis B, facilitating discrimination between acute and chronic infections. The World Health Organization (WHO) advocates universal testing of all blood donations for hepatitis B to uphold blood safety standards and prevent inadvertent transmission. As of 2019, 30.4 million individuals (constituting 10.5% of the estimated hepatitis B population) were cognizant of their infection, while 6.6 million (22%) of those diagnosed received treatment. Recent WHO estimates indicate a decline in the proportion of children under five years old harboring chronic HBV infection, dropping to below 1% in 2019 from approximately 5% in the pre-vaccine era spanning the 1980s to the early 2000s. In locales with elevated Hepatitis B surface antigen seroprevalence in the general populace (defined as >2% or >5% HBsAg seroprevalence), WHO advises universal HBsAg testing for all adults, coupled with access to and provision of linkage to prevention, care, and treatment services as warranted.

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