Viral Hepatitis Report

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Classification of viral hepatitis

Hepatitis is an inflammation of the liver. The inflammation of the liver leads to deterioration of liver function. It can be self-limiting or proceed to fibrosis (scarring), cirrhosis, or liver cancer. Hepatitis is most commonly caused by hepatitis viruses, although it can also be caused by infections, toxic substances (such as alcohol and some medicines), and autoimmune illnesses. Acute infection may occur with limited or no symptoms, or may include symptoms such as jaundice (yellowing of the skin and eyes), dark urine, extreme fatigue, nausea, vomiting and abdominal pain. Furthermore, chronic viral hepatitis can cause serious complications like hepatocellular carcinoma and liver cirrhosis.

Hepatitis is most commonly caused by viruses. Viral hepatitis has 5 main types of viruses. These 5 types are A, B, C, D, and E.

Since the early 1940s, hepatitis A and B have been recognized as distinct diseases that can be identified using specific serological tests. Delta hepatitis is an infection dependent on the hepatitis B virus. It can arise as a superinfection of an HBV carrier or as a co-infection with acute HBV infection.

Hepatitis A virus: classified as hepatovirus, is a small, unenveloped symmetrical RNA virus which shares many of the characteristics of the picornavirus family. HAV possesses four major polypeptides cleaved from a large precursor polyprotein. The surface proteins VP1 and VP3 are major antibody-binding sites.

Hepatitis B virus: a member of the hepadnavirus group, double-stranded DNA viruses which replicate via an RNA intermediate called pregenomic RNA (pgRNA) and reverse transcriptase. It consists of: outer surface protein (HBsAg), core protein (HBcAg), pre core (HBeAg) and enzyme reverse transcriptase.

Hepatitis C virus: is an enveloped single-stranded RNA virus with positive polarity which appears to be distantly related (possibly in its evolution) to flaviviruses and genus hepacivirus. packaged by core protein and enveloped by a lipid bilayer containing two viral glycoproteins (E1 and E2) to form the virion.

Hepatitis D virus: (delta) viral agent, single-stranded, circular RNA virus with a number of similarities to certain plant viral satellites and viroids. This virus requires hepadna virus helper functions for propagation in hepatocytes.

Hepatitis E virus: the cause of enterically-transmitted non-A, non-B hepatitis, is another non-enveloped, single-stranded RNA virus, which shares many biophysical and biochemical features with caliciviruses. has at least 4 different types: genotypes 1, 2, 3 and 4. Genotypes 1 and 2 have been found only in humans. Genotypes 3 and 4 circulate in several animals.

Epidemiology and the Global Burden of Viral Hepatitis:

Viral hepatitis pandemic takes a heavy toll on lives, communities and health systems. It is responsible for an estimated 1.4 million deaths per year from acute infection and hepatitis related liver cancer and cirrhosis, a toll comparable to that of HIV and tuberculosis. Of those deaths, approximately 47% are attributable to hepatitis B virus, 48% to hepatitis C virus and the remainder to hepatitis A virus and hepatitis E virus. Viral hepatitis is also a growing cause of mortality among people living with HIV. About 2.9 million people living with HIV are co-infected with hepatitis C virus and 2.6 million with hepatitis B virus.

Viral hepatitis (hepatitis A, hepatitis B, hepatitis C, hepatitis D, hepatitis E) affects millions of people around the world; hepatitis B and hepatitis C result in chronic infections and disproportionately impact certain countries. Viral hepatitis results in around 1.4 million deaths each year, HBV and HCV are responsible for about 90% of these fatalities, whilst the remaining 10% of fatalities are caused by other hepatitis viruses. Although viral hepatitis is a major public health problem across the globe it has not been prioritized until now. Lately, the "2030 Agenda for Sustainable Development Goals" of WHO has identified specific actions to prevent viral hepatitis.

The socioeconomic development status and burden of AVH are associated. It found that there is a negative association between socioeconomic development status and the burden of acute viral hepatitis. The lowest burden of acute viral hepatitis was noted for rich countries, whereas the highest burden of acute viral hepatitis was noted for poor countries.

Hepatitis A (HAV)

hepatitis A is endemic in most developing countries. The exact incidence of the disease is difficult to estimate because of the high proportion of asymptomatic cases. Hepatitis A (Hep A) can cause sporadic or epidemic disease and has been frequently linked to contamination of the global food chain. A safe and effective vaccine exists, which has impacted the global

epidemiology of Hep A infections since 1991, and universal childhood vaccination programs have reduced incidence rates significantly.

Globally, only 1.5 million clinical cases of HAV are reported annually while the rate of infection is much higher. In highly endemic countries nearly all children get infected at an early age, with mostly asymptomatic exposure, but acquire lifelong immunity. Paradoxically, in low endemic countries, most children and adults remain susceptible to symptomatic infection and the disease burden is high.

Geographical areas can be characterized as having high, intermediate or low levels of hepatitis A infection

1-Areas with high levels of infection:

In developing countries with very poor sanitary conditions, hygienic practices and limited access to clean water. Most children (90%) have been infected with the hepatitis A virus before the age of 10 years. Epidemics of hepatitis A are uncommon because older children and adults are generally immune. Symptomatic disease rates in these areas are low and outbreaks are rare. high endemic areas (such as parts of Africa and Asia)

2-Areas with low levels of infection: In developed countries with good sanitary and hygienic conditions, infection rates are low. Disease may occur among adolescents and adults in high-risk groups, such as injecting-drug users. outbreaks are more likely. However, Rates of hepatitis A infection remain low in children and adolescents due to childhood vaccination recommendations for hepatitis A starting in 1996. Low endemic area (such as the United States and Western Europe)

Hepatitis B (HBV)

Hepatitis B is globally one of the most common and severe infectious diseases that leads to significant morbidity and mortality. Approximately one-third of the World's population have been infected with HBV. Around 5% of this population are chronic carriers and a quarter of these carriers develop serious liver diseases such as chronic hepatitis, cirrhosis and hepatic carcinoma. Every year, 780000 HBV-related deaths are documented around the globe. In recent years, the incidence of acute hepatitis B and

the prevalence of hepatitis B chronic carriers have decreased in several countries because of the HBV universal vaccination programs started in the nineties.

Hepatitis C (HCV)

Globally, an estimated 58 million people have chronic hepatitis C virus infection, with about 1.5 million new infections occurring per year. WHO estimated that in 2019, approximately 290 000 people died from hepatitis C, mostly from cirrhosis and hepatocellular carcinoma (primary liver cancer). The highest burden of disease is in the Eastern Mediterranean Region and European Region, with 12 million people chronically infected in each region. In the South-East Asia Region and the Western Pacific Region, an estimated 10 million people in each region are chronically infected. Nine million people are chronically infected in the African Region and 5 million the Region of the Americas.

Hepatitis D

Hepatitis D virus (HDV) affects globally nearly 5% of people who have a chronic infection with hepatitis B virus (HBV). Worldwide, the number of HDV infections has decreased since the 1980s, due mainly to a successful global HBV vaccination programme. Several geographical hotspots of high prevalence of HDV infection including Mongolia, the Republic of Moldova, and countries in western and central Africa.

Hepatitis E

Hepatitis E is found worldwide, but the disease is most common in East and South Asia. Every year there are an estimated 20 million HEV infections worldwide, leading to an estimated 3.3 million symptomatic cases of hepatitis E.WHO estimates that hepatitis E caused approximately 44 000 deaths in 2015 (accounting for 3.3% of the mortality due to viral hepatitis).

Epidemiology of viral hepatitis in Saudi Arabia

An epidemiological study conducted in Saudi Arabia found that the average annual incidence of seropositivity per 100,000 served population was the highest for HBV infection (104.6 per 100,000), followed by HCV (78.4 per 100,000). Furthermore, HBV infection was reportedly more virulent than HIV infection up to 100 times. Accordingly, considering the implications of associated comorbidities more aggressive screening is required for HBV infection compared to

HCV infection. In the KSA, the transmission of HBV is predominantly horizontal through blood and its derivatives, hemodialysis, intravenous route, or via percutaneous means. Also, HBV has a high rate of transplacental transmission causing fetal and neonatal hepatitis. However, the occurrence of HBV in KSA has declined over the past three decades, consequent to the initiation of HBV vaccination and the Ministry of Health's (MoH) strategy over the prevention of viral hepatitis.

According to the last updated transcript of statistical yearbook (2020), the Saudi Ministry of Health have recorded 6452 new cases with viral hepatitis, and they were classified as (66.97% HBV, 31.53% HCV, and 1.5% HAV). Riyadh city has reported the highest number of cases for HBV and HCV and HAV, followed by Jeddah.

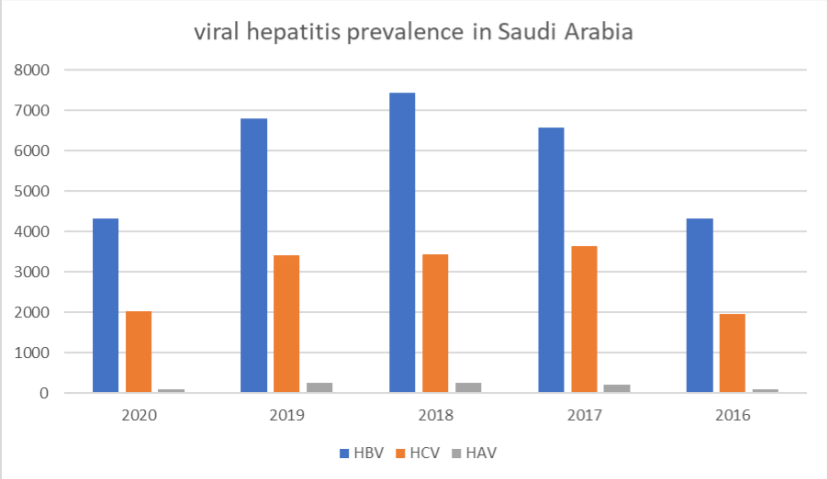


Figure 1: Viral hepatitis incidence rate per 100,000 population over the past 5 years

The general direction of viral hepatitis prevalence in Saudi Arabia in the last five years is fairly stable to declining, with a noticeable difference in reported cases between the years 2020 and 2019. The incidence rate per 100,000 population (2020) for HBV was 12.32 which is the highest, HCV 5.8, HAV 0.28. The age of the reported cases from three common type of viral hepatitis was predominantly revolves around the adult age group more than younger population.

HAV

HAV: In 2008 the prevalence of HAV was 18.6%, which is a considerable drop from 90-100% in the 1980s. The main reason for this decline is the improved socioeconomic standards across the country, but the prevalence still varies within the country depending on the hygienic conditions of the province.

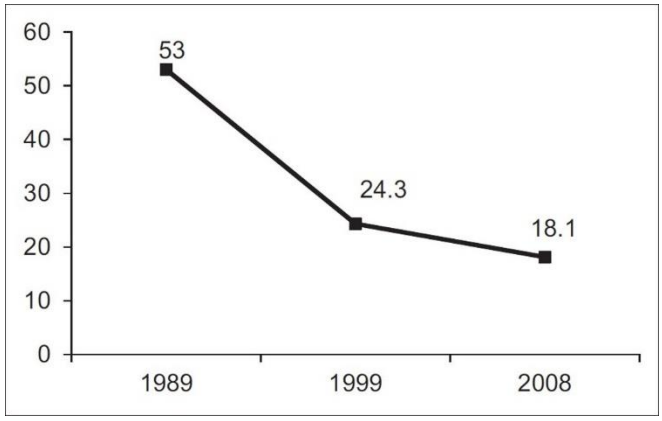


Figure 2: Changing patterns of hepatitis A prevalence within the Saudi population over 18 years

HBV

A large number of studies have been conducted in KSA, between 1965 and 2013 found a prevalence of 3.2% for the country which is slightly lower than the worldwide prevalence of 3.6%. In this systematic review, a decrease in prevalence has been observed over time, and hence it is expected that the current prevalence rate in KSA would be lower than the average found. Prevalence of chronic HBV (CHB) will be lower in the younger population (<30 years), compared with the older population, due to the impact of the vaccination program.

HCV

Prevalence assessed from Saudi blood donor screening centers indicates HCV infection rates of 0.4-1.1%. Declines in HCV prevalence rates were also noted in the blood bank database of King Khalid University Hospital in Riyadh. Similar to HBV, HCV is more prevalent in adults compared to children.

Modes of transmission:

HAV

The hepatitis A virus is found in the stool and blood of people who are infected. The hepatitis A virus is spread when someone ingests the virus (even in amounts too small to see) through:

- Person-to-person contact

Hepatitis A can be spread from close, personal contact with an infected person, such as

through certain types of sexual contact (like oral-anal sex), caring for someone who is ill, or using drugs with others. Hepatitis A is very contagious, and people can even spread the virus before they feel sick.

- Eating contaminated food or drink

Contamination of food with the hepatitis A virus can happen at any point: growing, harvesting, processing, handling, and even after cooking. Contamination of food and water happens more often in countries where hepatitis A is common.

Although uncommon, foodborne outbreaks have occurred in the United States from people eating contaminated fresh and frozen imported food products.

HBV

HBV is transmitted through activities that involve percutaneous (i.e., puncture through the skin) or mucosal contact with infectious blood or body fluids (e.g., semen and saliva), including

- Sex with an infected partner
- injection-drug use that involves sharing needles, syringes, or drug-preparation equipment;
- birth to an infected mother;
- contact with blood from or open sores on an infected person;
- exposures to needle sticks or sharp instruments; and
- sharing certain items with an infected person that can break the skin or mucous membranes (e.g razors, toothbrushes, and glucose monitoring equipment), potentially resulting in exposure to blood**.**

Hepatitis B is not transmitted by breastfeeding, food, hugging, kissing, hand holding, coughing or sneezing.

HCV

The hepatitis C virus is a bloodborne virus. It is most commonly transmitted through:

- the re-use or inadequate sterilization of medical equipment, especially syringes and needles in healthcare settings;
- the transfusion of unscreened blood and blood products; and

- injecting drug use through the sharing of injection equipment.

HCV can be passed from

- an infected mother to her baby
- sexual practices that lead to exposure to blood (for example, people with multiple sexual partners and among men who have sex with men)

However, these modes of transmission are less common.
Hepatitis C is not spread through breast milk, food, water or casual contact such as hugging, kissing and sharing food or drinks with an infected person.

Hepatitis D Virus

The routes of HDV transmission, like HBV, occur through

- broken skin (via injection, tattooing etc.)
- or through contact with infected blood or blood products.
- Transmission from mother to child is possible but rare.

Vaccination against HBV prevents HDV coinfection and hence expansion of childhood HBV immunization programmes has resulted in a decline in hepatitis D incidence worldwide.

Hepatitis E Virus

Hepatitis E infection is found worldwide and is common in low- and middle-income countries with limited access to essential water, sanitation, hygiene and health services, and the outbreaks usually follow periods of fecal contamination of drinking.

Risk Factors

HAV Risk Factors:

The hepatitis A virus can infect anyone who has not been immunized or has been infected previously. The majority of hepatitis A infections occur during childhood, in locations where the virus is common (high endemicity).

The following are some of the risk factors:

- Traveling to areas of high endemicity without being immunized.
- Poor sanitation.
- Lack of safe water.
- Living in a household with an infected person.
- Being a sexual partner of someone with acute hepatitis A infection.
- Recreational drug usage. Such as, stimulants, and hallucinogens.
- Sex between men.

HBV Risk Factors:

Hepatitis B spreads through contact with blood, semen or other body fluids from an infected person.
The risk of hepatitis B infection increases with the following:

- Havingunprotectedsexwithmultiplepartnersorwithsomeonewho'sinfectedwith HBV.
- Sharing needles during IV drug use.
- Sex between men.
- Living with someone who has a chronic HBV infection.
- Infant born to an infected mother.
- Having a job that exposes you to human blood.
- Traveling to regions with high infection rates of HBV.
- HIV infected patient.

HCV Risk Factors:

Risk of hepatitis C infection is increased with the following:

- Having a job that exposes you to human blood.
- Sharing needles during IV drug use.
- Having HIV.
- Received a piercing or tattoo in an unclean environment using unsterile equipment.
- Received a blood transfusion or organ transplant before 1992.
- Received clotting factor concentrates before 1987.
- Received hemodialysis treatments for a long period of time.
- Infant born to an infected mother.
- Have been in prison.

Causative agent communicability, Infectivity and Incubation Period

Clinical presentation and communicability:

Viral hepatitis is usually contagious, while many types of hepatitis are spread primarily by blood-to-blood contact, such as needle sharing, acupuncture, sexual intercourse, and organ donation.
The clinical manifestations of infectious hepatitis vary depending on the individual and the causative virus. At the time of diagnosis, some patients may be completely asymptomatic or only mildly symptomatic. The classic presentation of infectious hepatitis is divided into four phases:

Phase 1 (viral replication phase) – Patients are asymptomatic, but laboratory tests expose hepatitis serologic and enzyme markers.
Phase 2 (prodromal phase) – Anorexia, nausea, vomiting, alteration in taste, arthralgias, malaise, fatigue, urticaria, and pruritus are common symptoms, and some patients develop an aversion to cigarette smoke; when seen by a healthcare provider during this phase, patients are often diagnosed with gastroenteritis or a viral syndrome.

Phase 3 (icteric phase) – Patients may notice dark urine and pale-colored stools, as well as gastrointestinal (GI) symptoms and malaise. Patients may also become icteric and develop right upper quadrant pain with hepatomegaly.
Phase 4 (convalescent phase) – Symptoms and icterus resolve, liver enzymes return to normal

Infectivity:

- **HAV:** when inoculated orally, subcutaneously, or intramuscularly, small volumes of sera (0.05–4 ml) from hepatitis A patients were sufficient to initiate infection.
- **HBV:** the minimum 50% chimpanzee infectious dose (CID50) was determined to be approximately 10 copies.
- **HCV:** Infectivity of HCV cell culture (HCVcc) was distributed across fractions 1 to 15 (1.01 to 1.12 g/ml), with no infectivity beyond fraction 18 (1.17 g/ml).

Incubation period:
Hepatitis A:

The incubation period of hepatitis A is normally 14–28 days. Adults are more likely than children to have the disease signs and symptoms.

Hepatitis B:

The hepatitis B virus has an incubation period of 30 to 180 days. The virus can be detected 30 to 60 days after infection and can persist and progress to chronic hepatitis B, especially if it is transmitted during childhood or infancy.

Hepatitis C:

The incubation period of hepatitis C ranges from 2 weeks to 6 months.

History taking

The patient's history and physical examination findings provide important information to guide further evaluation and management. The focus of history taking and the physical examination varies depending on the context of the clinical evaluation.

Questions should be asked for everyone:

- Personal information: (gender - age - ID)
- Demographic information: (race - ethnicity)

Taking history for symptomatic patients

Questions should be asked for symptomatic patients:

- Vaccination history: (hepatitis A - hepatitis)
- Contact with a jaundiced person
- Body piercing
- tattoos
- IV drug use
- Sexual practice
- Needle stick exposure
- Travel to endemic area
- Occupation: (Health-care and public-safety workers)
- Blood transfusion

- Hemodialysis patients
- IV infusions

Taking history in Travel and preventive medicine clinic:

Travel Clinic: A Clinic that provides up to date, accurate information of the health and safety aspects of specific destinations to travelers, it ensures that the traveler remains healthy during his travels and returns home healthy.

Travel clinic outcomes:

- food and water precautions
- vaccines recommendation: unvaccinated people should be vaccinated before traveling to countries where hepatitis A is common
- pre-travel and post-travel testing
- advice on avoiding contact with a jaundiced patient
- health insurance

Questions should be asked in the clinic:

- detailed list of current medications
- medication allergies
- Vaccine allergies
- detailed vaccination history
- chronic medical conditions
- Immunocompromised state
- itinerary listing not only countries and cities but also special activities

Hepatitis Investigation

Hepatitis A Serologic Test:

Testing for Hepatitis A serology may be indicated for the work-up of patients with suspected acute viral hepatitis, to determine immune status (following recovery from natural infection or as a result of immunization), and as part of an epidemiologic investigation.

Test		Interpretation
HAV RNA IgM	**positive** **positive**	Acute infection
HAV RNA IgG	**negative** **positive**	postexposure or immunized

- **Hepatitis A virus RNA:** HAV has a linear, uncapped, single-stranded RNA genome which can be detected by polymerase chain reaction (PCR) with reverse transcription (RT) step (RT-PCR) prior to antibody development.
- **Hepatitis A IgM Antibody:** Serological diagnosis of acute viral hepatitis A depends on the detection of specific anti-HAV IgM. Its presence in the patient's serum indicates a recent exposure to HAV. Usually it's detectable by the time symptoms occur, which is 15-45 days after exposure.
- **Hepatitis A IgG Antibody:** HAV-specific IgG antibody level in serum rises quickly once the virus is cleared and may persist for many years.

Hepatitis B Serologic Test:

Hepatitis B serologic testing involves measurement of several hepatitis B virus (HBV)-specific antigens and antibodies. Different serologic "markers" or combinations of markers are used to identify different phases of HBV infection and to determine whether a patient has acute or chronic HBV infection, is immune to HBV as a result of prior infection or vaccination, or is susceptible to infection.

Test		interpretation
HBsAg Anti-HBc Anti-HBs	**negative** **negative** **negative**	Susceptible
HBsAg Anti-HBc Anti-HBs	**negative** **positive** **positive**	Immune due to natural infection
HBsAg Anti-HBc Anti-HBs	**negative** **negative** **positive**	Immune due to hepatitis B vaccine
HBsAg Anti-HBc IgM anti-HBc Anti-HBs	**positive** **positive** **positive** **negative**	acutely infected
HBsAg Anti-HBc IgM anti-HBc Anti-HBs	**positive** **positive** **Negative** **negative**	chronically infected
HBsAg anti-HBc anti-HBs	**negative** **positive** **negative**	Interpretation unclear; four possibilities: 1. Resolved infection (most common). 2. False-positive anti-HBc, thus susceptible. 3. "Low level" chronic infection. 4. Resolving acute infection.

- **Hepatitis B surface antigen (HBsAg):** A protein on the surface of hepatitis B virus; it can be detected in high levels in serum during acute or chronic hepatitis B virus infection. The presence of HBsAg indicates that the person is infectious. The body normally produces antibodies to HBsAg as part of the normal immune response to infection. HBsAg is the antigen used to make hepatitis B vaccine.
- **Hepatitis B surface antibody (anti-HBs):** The presence of anti-HBs is generally interpreted as indicating recovery and immunity from hepatitis B virus infection. Anti-HBs also develops in a person who has been successfully vaccinated against hepatitis B.
- **Total hepatitis B core antibody (anti-HBc):** Appears at the onset of symptoms in acute hepatitis B and persists for life. The presence of anti-HBc indicates previous or ongoing infection with hepatitis B virus in an undefined time frame.
- **IgM antibody to hepatitis B core antigen (IgM anti-HBc):** Positivity indicates recent infection with hepatitis B virus (<6 m). Its presence indicates acute infection.

Hepatitis C Serologic Test:

Testing for Hepatitis C Virus (HCV) antibodies is indicated for the work-up patients with suspected chronic viral hepatitis or those with unexplained elevation in their liver function tests (e.g. ALT, AST), for screening those at high risk of infection (e.g. intravenous drug users, etc.).

Test		interpretation
Anti-HCV HCV RNA	**negative** **negative**	Non-reactive
Anti-HCV HCV RNA	**positive** **positive**	current infection
Anti-HCV HCV RNA	**positive** **negative**	past infection

- **Hepatitis C virus RNA:** The qualitative HCV RNA tests will report whether the hepatitis C virus is present in the bloodstream or not.
- **Hepatitis C virus antibodies:** HCV antibody test, is used to find out if the patient has ever been infected with the hepatitis C virus.

Measures of control and prevention

Hepatitis A:

Prevention Measures of Hepatitis A:

- Taking hepatitis A vaccine
- Practicing good hand hygiene — including thoroughly washing hands after using the bathroom, changing diapers, and before preparing or eating food
- adequate supplies of safe drinking water
- proper disposal of sewage within communities

Prophylaxis Against HAV Infection:

- **Hepatitis A vaccine:** Vaccination with the full, two-dose series of hepatitis A vaccine is the most effective way to prevent infection. it's safe and provide long term protection.
- **Hepatitis A Immune Globulins:** GamaSTANTM S/D is a sterile, preservative-free solution of IG for intramuscular administration and is used for both pre- and post-

exposure prophylaxis against disease caused by infection with hepatitis A, measles, varicella, and rubella viruses.

Hepatitis A vaccine

- **Preparation:** Inactivated vaccines and contain an **aluminum** adjuvant.
- **Vaccine Storage and Shipment:** HepA vaccine should be stored and shipped at temperatures ranging from 36°F to 46°F (2°C to 8°C) and should not be frozen

According to CDC hepatitis A vaccination is recommended for:

- Children
    - All children aged 12–23 months
    - Unvaccinated children and adolescents aged 2–18 years

- People at increased risk for HAV infection
    - International travelers
    - Men who have sex with men
    - People who anticipate close personal contact with an international adoptee
    - People experiencing homelessness

Serological testing for hepatitis A vaccine:

Serological testing for immunity to hepatitis A is not routinely recommended before receiving hepatitis A vaccine. If a person is recommended for vaccination and has no records of previous vaccination, they should receive a vaccine.
However, certain groups of people should be screened for natural immunity to hepatitis A to avoid unnecessary vaccination:

- people who were born before 1950
- people who spent their early childhood in hepatitis A–endemic areas
- people with an unexplained previous episode of hepatitis or jaundice

These people need to be tested for total hepatitis A antibodies or IgG antibodies against hepatitis A virus, if the test is positive the vaccine is not recommended for them.

Post-exposure Prophylaxis:

Hepatitis A vaccine should be administered as soon as possible, within 2 weeks of exposure, to all unvaccinated people aged ≥12 months who have recently been exposed to hepatitis A virus. In addition to hepatitis A vaccine, co-administration of GamaSTAN S/D immune globulin is recommended.

Hepatitis B:

Prevention Measures of Hepatitis B:

- Wash your hands thoroughly with soap and water after any potential exposure to blood.
- Use condoms with sexual partners.
- Avoid direct contact with blood and bodily fluids.
- Clean up blood spills with a fresh diluted bleach solution
- Cover all cuts carefully.
- Avoid sharing sharp items such as razors, nail clippers, toothbrushes, and earrings or body rings.
- Discard sanitary napkins and tampons into plastic bags.
- Avoid illegal street drugs (injecting, inhaling, snorting, or popping pills).
- Make sure new, sterile needles are used for ear or body piercing, and acupuncture.

Prophylaxis Against HBV Infection:

- **Hepatitis B Vaccines:**
  The best way to prevent hepatitis B. Completing the series of shots (2, 3, or 4 doses, depending on the manufacturer) is needed to be fully protected.
- **Hepatitis B Immune Globulins:** HBIG is generally used as an adjunct to HepB vaccine in infants born to HBsAg-positive mothers and in certain other post-exposure prophylaxis situations.

Hepatitis B Vaccine Ingredients:
Growing the active ingredients for the vaccines:

- Hepatitis B vaccines contain one of the proteins from the surface of the hepatitis B virus (**HepB surface antigen, or HBsAg**). This protein is made by inserting the genetic code into yeast cells, which removes any risk of viral DNA getting into the final product. This process is called recombinant DNA technology.

Apart from the active ingredients (the antigens), hepatitis B vaccines contain very small amounts of this added ingredient:

- **Aluminium**, which strengthens and lengthens the immune response to the vaccine.

The Advisory Committee on Immunization Practices (ACIP) recommends that the following people receive hepatitis B vaccination:

- All infants.
- Unvaccinated children aged <19 years.
- People at risk for infection by sexual exposure.
    - Sex partners of people testing positive for hepatitis B surface antigen (HBsAg).
    - Sexually active people who are not in a long-term, mutually monogamous relationship (e.g., people with more than one sex partner during the previous 6 months).
    - People seeking evaluation or treatment for a sexually transmitted infection.
    - Men who have sex with men.
- People at risk for infection by percutaneous or mucosal exposure to blood.
    - People who currently inject or have recently injected drugs.
    - Household contacts of people who are HBsAg-positive.
    - Residents and staff of facilities for developmentally disabled people.
    - Health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids.
    - Hemodialysis patients and predialysis, peritoneal dialysis, and home dialysis patients.
- International travelers to countries with high or intermediate levels of endemic hepatitis B virus (HBV) infection (HBsAg prevalence of ≥2%).
- People with hepatitis C virus infection.
- People with chronic liver disease (including, but not limited to, people with cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, and an alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice the upper limit of normal).
- People with HIV infection.

Hepatitis B serologic testing and vaccine indication:

Different serologic “markers” are used to identify different phases of HBV infection and to determine whether the patient has immunity to HBV as a result of prior infection or vaccination or is susceptible to infection.

Test				interpretation	vaccinate
HBsAg	Anti-HBc	Anti-HBS	IgM anti-HBc		
-	-	-		Susceptible	Vaccinate if indicated
-	-	+		Immune due to vaccine	No vaccination necessary
-	+	+	-	Immune due to natural infection	No vaccination necessary
+	+	-	+	acutely infected	No vaccination necessary
+	+	-	-	chronically infected	No vaccination necessary (may need treatment)

Perinatal Transmission:

Perinatal HBV transmission can be prevented by identifying HBV-infected (i.e., hepatitis B surface antigen [HBsAg]-positive) pregnant women and providing **hepatitis B immune globulin** and **hepatitis B vaccine** to their infants within 12 hours of birth.
Preventing perinatal HBV transmission is an integral part of the national strategy to eliminate hepatitis B in the United States.

Post Exposure Prophylaxis:

After exposure to hepatitis B virus (HBV), appropriate and timely prophylaxis can prevent HBV infection and subsequent development of chronic infection or liver disease. The mainstay of postexposure prophylaxis (PEP) is hepatitis B vaccine, but, in certain circumstances, **hepatitis B immune globulin** is recommended in addition to **vaccines** for added protection.

Depending on immunization status, affected individuals will either receive:

- Active immunization (i.e., hepatitis B vaccination).

- Passive immunization (i.e., hepatitis B immune globulin).
- Combined active and passive immunization.
- No intervention.

Hepatitis C:

Until this day there is no vaccine against hepatitis C, because the virus has multiple genotypes and subtypes and mutates rapidly, so the prevention of HCV infection depends upon reducing the risk of exposure to the virus.

Primary prevention interventions recommended by WHO include:

- safe and appropriate use of health care injections.
- safe handling and disposal of sharps and waste.
- provision of comprehensive harm-reduction services to people who inject drugs, including sterile injecting equipment.
- testing of donated blood for HBV and HCV (as well as HIV and syphilis).
- prevention of exposure to blood during sex and use condoms.

Viral Hepatitis Prevention and Control in Saudi Arabia

Due to the prevalence of viral hepatitis in KSA the Ministry of Health has employed the following measures to aid the diagnosis and control of the disease:

1. Premarital screening requires laboratory testing for infectious disease e.g, hepatitis B & hepatitis C.
2. Saudi Arabia follows the standard screening procedures for dialysis patients and blood bank donors (which includes hepatitis B & hepatitis C screening)
3. The MOH provides free screening and treatment for Saudi patients.
4. Under the Health Sector Transformation Program (Objective 2.1.3), the MOH aims to promote prevention of health risks, which includes combating infectious diseases like viral hepatitis, influenza, and other emerging diseases such as the novel coronavirus (COVID-19). This will be done by activating functions and operations of the National Center for Disease Prevention and Control

Hepatitis A control and prevention:

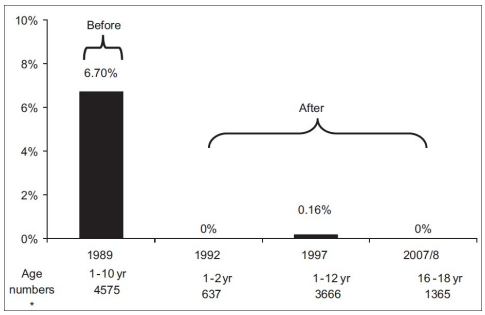
The main factor that caused a drop of cases of HAV was the improvement in socioeconomic standards and the addition of the hepatitis A vaccine to the National Immunization Schedule, but despite these efforts HAV remains endemic to the region.

Hepatitis B control and prevention:

In 1989 KSA became the first country in the middle east to implement the hepatitis B vaccine and by 1990 it was routinely given to school children and infants, which resulted in the prevalence of HBsAg to drop from 6.7% in 1990 to 0.05% in 1999, among school children below the age of 15. These results show a clear decline in the incidence of HBV mainly due to the vaccine.

Other measures that have resulted in a decline of cases include: screening for high risk populations and educating the public on methods of disease spread and prevention.

***Prevalence of HBsAg among the Saudi population documented before and after introducing a nation-wide HBV vaccination program, over an 18-year period**



Hepatitis C control and prevention:

Due to the lack of an effective vaccine against hepatitis C prevention mainly depends on reducing exposure to the virus in healthcare settings and high-risk individuals.

So, the general declines in incidence and prevalence of HCV in KSA may be attributed to:

1. Safer blood transfusion, surgical, dental, and procedural practices
2. Overall improvement in sanitation
3. Better standard of life
4. Screening of all expats entering the country.

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