

## Hepatitis and its Transmission Through Needlestick Injuries

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### ABSTRACT

Hepatitis B and C are one of the most commonly transmitted viral infections through needlestick injury apart from HIV. It is highly prevalent in India and many other developing countries. It accounts for high mortality rate globally amongst low socio-economic groups of individuals. Healthcare workers, especially dental professionals are at higher risk of infection due to high exposure to saliva, blood and sharps. Accidental occupational exposure to non-sterile conditions and its development to more critical and fatal conditions can be reduced through vaccination, prophylactic medications and practicing high safety measures.

This review article focuses on transmission of hepatitis through sharps injuries in medicine, especially dentistry, its prevention, management, post-exposure prophylaxis and the corresponding content.

**Keywords:** Hepatitis, Dental professionals, Sharps injuries, Occupational exposure, Prevention, Post-exposure prophylaxis.

### 1. Introduction to Viral Hepatitis

Hepatitis or inflammation of liver is mostly caused by infection with hepatitis viruses which primarily uses liver as main site for replication, which in turn leads to notable weariness and lethality. Hepatitis A, B, C, D and E (HAV, HBV, HCV, HDV and HEV) are the five familiar viruses which causes viral hepatitis.

Hepatitis viruses differ widely in modes of replication, morphology, genome and taxonomy; the utmost routes are enteral or parenteral [1].

Enterally transmitted are HAV and HEV cause acute self-limiting infection while HBV HDV and HCV are parenterally (infected blood and blood products, body fluids), congenitally, and sexually transmitted acute infection having high possibility to become chronic. Table tops, blades and blood stains can remain infective for about a week.

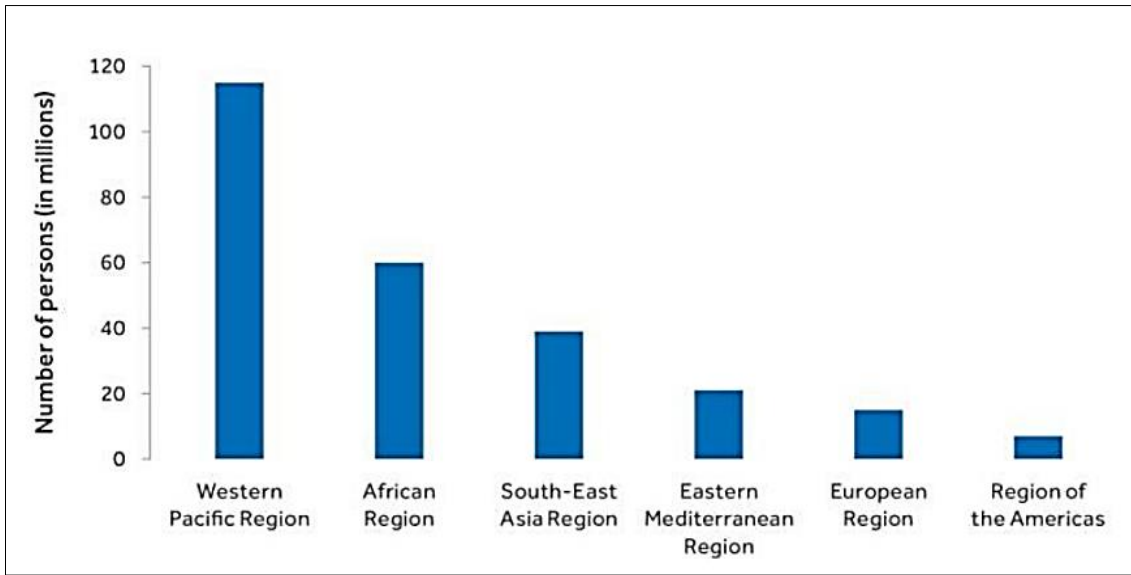
### 2. Epidemiology

The WHO estimates that 325 million people in the world live with Hepatitis B and C [2].

2016 WHO estimates show 7134 persons deaths from hepatitis A worldwide accounting for its 0.5% of the mortality rate, mostly due to fulminant hepatitis aka acute liver failure. Hepatitis A infection is commonly seen in low- and middle-income countries with poor sanitary conditions and hygiene. Children below the age of 10 years are most commonly affected (90%) [3].

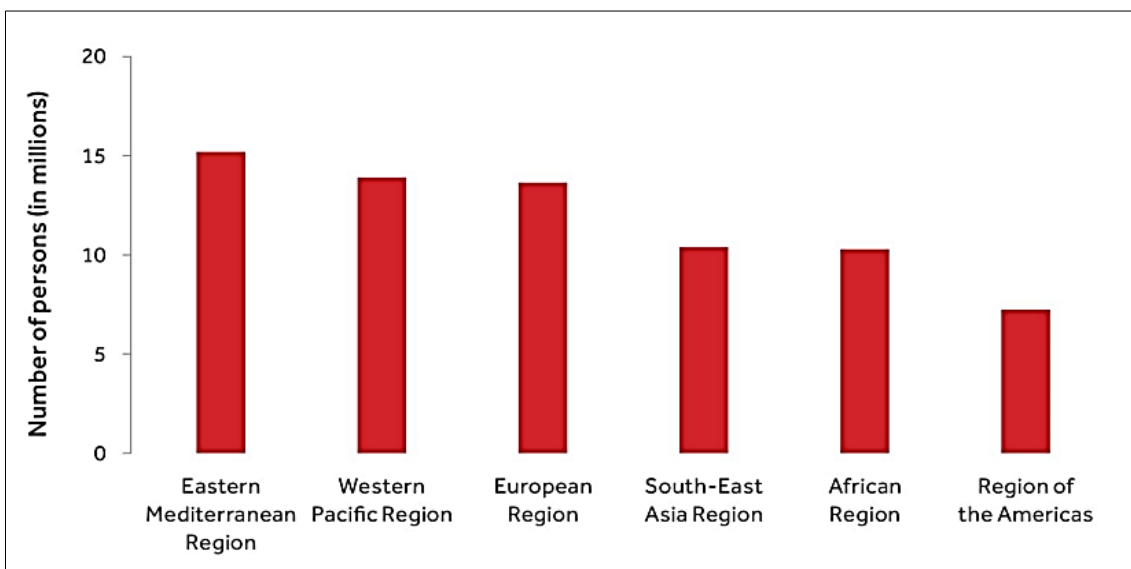
As of 2019, 296 million people were living with chronic hepatitis B globally. It has eventualised 820,000 deaths, mostly from cirrhosis and hepatocellular carcinoma [4]. The amount of infection is reported highest in WHO Western Pacific Region with 116 million individuals chronically infected individuals followed by WHO African Region, WHO South-East Asia Region, WHO Eastern Mediterranean Region, WHO European Region and WHO Region of the Americas in decreasing order [5].

Hepatitis D virus co-infects nearly 5% individuals with Hepatitis B; the combination is considered the deadliest [6].



**Fig.1.** Global burden of HBV [5]

2019 WHO estimates show 58 million people have chronic hepatitis C virus infection, with approximately 290,000 people dying from it [7]. The amount of infection is reported highest in WHO Eastern Mediterranean, followed by WHO Western Pacific Region, then WHO European Region, then WHO South-East Asia Region, then WHO African Region and least in WHO Region of the Americas [5].



**Fig.2.** Global burden of HCV [5]

Hepatitis E infects 20 million people globally with a mortality rate of 3.3%. The infection is present worldwide, but is most common in East and South Asia [8].

### 3. Etiology & Risk Factors

Viruses, harmful substances, medical conditions, toxic substances (e.g. alcohol or drugs) and autoimmune diseases cause hepatitis, most common being viruses.

Risk factors can be classified into 3 categories [9]:

1. Environmental
2. Behavioral
3. Health

Lack of sanitation, unsafe water for drinking and daily chores, contact with used sharps and needles are included in environmental risk factors. Passing excreta in open areas in the absence of washrooms can become a source of infection for the public living around. This also pollute the local water source, thus spreading the disease further. The exposure of used syringes and sharps is the maximum in healthcare sectors, making them highly at risk [2].

Sharing needles, unsafe sexual contact especially MSM, work environment with high exposures to certain toxic chemicals example painters, healthcare workers, cleaners etc. High consumption of alcohol for a long period of time also contributes to developing hepatitis and its related complications [9].

Absence of appropriate vaccination (HAV and HBV vaccines), acute/chronic infection with the viruses, and congenital transmission are included in health-related risk factors. Auto-immune disorders like APECE also increases risk [9].

Some OTC and prescription medications like amoxicillin-clavulanate, birth control medication, halothane, methyldopa, anabolic steroids, NSAIDS, Statins, tetracycline, etc. can cause toxic hepatitis [9].

#### **4. Hepatitis Spread through Needlestick Injuries**

Needlestick injury is the accidental puncturing of the skin and mucous membrane by used needles and sharps. Needlestick and sharps injury is one of the many occupational hazards faced by medical personals. The ongoing pandemic has increased this challenge further.

Healthcare workers are frequently at high risk for acquiring dire and alarming infections like HBV and HCV through needlesticks and sharps as in-service activities are closely related patients' blood or body fluids and they might sustain sharp related injuries or splashes to eyes and mucus membranes. Sharps injury serves as the mode of transmission for this occupational hazard. Dental professionals especially are at higher risk of infection due to high exposure to saliva, blood and sharps.

HBV, apart from sexual route, spreads maximally through blood of an infected individual to an uninfected individual who has been in contact with their blood. Blood contact can be established via:

1. Sharing syringes amongst drug abusers.
2. Reusing of other individual's needles accidentally.
3. Transfusion of un-screened blood.
4. Transplacentally [10].

Occupationally, blood contact can be established majorly through needlestick injuries, when,

1. Working the blood sample in laboratory.
2. Collecting sample for the same.

3. Accidentally pricking yourself with the needle used for a positive patient.
4. Getting a cut/abrasion from the scalpel, high speed dental instruments/suturing needle used for a positive patient.
5. Blood/saliva coming in contact with an open wound or even a minute rash on the medical professionals' body.
6. In future steps of biomedical waste management [10].

HCV RNA is found in high titres in the saliva of an infected individual; thus, its transmission can possibly occur through saliva. Although not many proves have been in the favor of this transmission route, it still poses a great threat to the dental and other health professionals [11].

Individuals working with aggressive, biting patients are at risk of contracting the disease. Accidental scratches or lacerations from a used or insufficiently sterilized instrument during or after a dental procedure can also transmit the virus. This however, doesn't counter the fact that HCV, just like HBV, has the maximum transmission through blood contact, especially through sharps and needlestick injuries.

Most of the above contacts occur due to accidental percutaneous injury via mishandled sharps and needles. The used instruments have traces of the infected fluid containing the virus or its elements, which are inoculated in the individual enduring the injury.

Needlestick injury thus serves as one of the biggest occupational hazards for medical professionals, making them truly vulnerable to Hepatitis viruses. The vulnerability of dental professionals, students, technicians and helping staff increases multifold as they are exposed not only to sharp injuries but also to infected patients' saliva, both of which can be considered as the greatest pool harboring the viruses.

In a dental setup, the infections can be precipitated through direct and indirect contact with blood, oral fluid and droplet splatter and aerosol generation. A dentist might contract the disease by accidental cuts and pricks endured via sharps covered in patients' blood and saliva [11],[15]. These kinds of injuries can again be categorized under the umbrella of needlestick injury.

Thus, it becomes of high importance that every health-care professional must take precautions seriously to cut down the rate of transmission and possible infection thereof.

### **5. Prevention of Needlestick Injuries**

Percutaneous injuries can occur during and after use of sharp devices. Some preventive measures include:

1. Wearing gloves and double gloving.
2. Avoiding recapping needles by two-handed technique.
3. Usage of curved suturing needle instead of handheld straight suture needle.
4. Handlers must be trained beforehand.
5. Devices with engineered NSI protection must be used.
6. Puncture resistant containers must be located as close as possible to discard the sharps.
7. While disposing, certain measures are to be followed- don't force sharps into container, don't put finger into the container, don't remove needle from syringe after usage, don't bend/break needle.

## 6. Prevention of Hepatitis

Hepatitis is a wide-spread problem affecting millions of people around the world. As it is said-prevention is better than cure- high risk groups must always strive for implementation of preventive measures. The most sought-after measure is Vaccination.

Hepatitis B vaccine is the vaccine of choice according to WHO and CDC and works for lifetime. It is considered an ‘anti-cancer’ vaccine as it prevents acceleration of hepatitis B to liver cancer. All infants and children up to 18yrs of age are recommended to get the shot. Babies born to infected mothers have maximum first 12 hours of life to receive the first dose of hepatitis B [12]. Likewise, individuals of high-risk groups are to be vaccinated, some of which are-

- A. Probable sexual partners of hepatitis B-positive persons,
- B. Sexually promiscuous i.e., more than one sex partner during the previous six months,
- C. drug users using injection,
- D. Healthcare and public safety workers at risk for exposure to blood,
- E. Adults with diabetes up to 60 years of age, etc [12].

## 7. Dose Schedule

<b>1st Shot</b>	At any given time (new-borns must receive this dose in the delivery room within 24 hrs).
<b>2nd Shot</b>	At least one month or 28 days after the 1st shot.
<b>3rd Shot</b>	At least 4 months or 16 weeks after the 1st shot (Infants should be a minimum of 24 weeks old at the time of the 3rd shot) [12].

Occupational preventive measures include-

- A. Shielded and appropriate use of injections;
- B. safe handling and clearance of sharps and waste;
- C. use barriers to prevent splashes;
- D. promote vaccination.

## 8. Treatment of Hepatitis

Chronic hepatitis B can often be successfully treated. Commonly used drugs to treat chronic hepatitis B are [13]:

- A. Entecavir
- B. Telbivudine
- C. Tenofovir alafenamide
- D. Tenofovir disoproxil fumarate

- E. Interferon alfa-2b
- F. Peginterferon alfa-2a

If you endure any kind of sharps injury from a suspected patient, 4 steps are to be followed-

1. Bleed the wound.
2. Wash the wound under running water.
3. Seal the wound to prevent further contamination.
4. Inform authorities to get tested and post-exposure prophylaxis (PEP) done immediately if needed.

### 8.1. Post-exposure prophylaxis (PEP)

If positive after the injury, PEP is advised to the individual to prevent acceleration of the disease to conditions like liver cirrhosis and liver cancer [13].

If exposed person is unvaccinated	1 dose of Hepatitis B immunoglobulin (HBIG) + initiation of Hepatitis B vaccination [14].
If exposed person is vaccinated	a. if adequate anti-HBs present – no treatment needed. b. if inadequate anti-HBs present – 1 dose of HBIG + booster dose of vaccine [14].

According to WHO, combination of vaccine and HBIG has higher efficacy in preventing HBV infection as compared to one of them alone. PEP is followed by routine follow-ups and counseling [14].

Drugs used for hepatitis C infection [13]:

- A. Simeprevir
- B. Daclatasvir
- C. Sofosbuvir
- D. Ombitasvir
- E. Elbasivir/grazoprevir
- F. Glecaprevir/pibrentasvir

If you endure any kind of sharps injury from a suspected patient, 4 steps are to be followed similarly as above, followed by routine follow ups and counseling. No PEP is required as body's immunity work against HCV [14].

### 9. Conclusion

Viral hepatitis is a cruel pathosis; with the larger part of infected individuals being oblivious of their condition, which results in escalated fatalities that increases each year [16]. Vaccination, education and prevention of occupational spread must be promoted with great zeal in order to reduce its global burden. Dental professionals must strive for better work conditions in order to reduce the hazard. Although measures to control infection have been employed, forecasting reduction in the spread of the virus, eradication or significant disease cutback remains a long way off. The global onus of the disease remains compelling [16].

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### *Consent for publication*

*Authors declare that they consented for the publication of this research work.*

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