# The GI System

# Microbiology

☑ Sheet ☐ Slide ☐ Handout

Number: **#1**

Subject: **Hepatitis A & B**

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بسم الله الرحمن الرحيم

# In this lecture, we are going to discuss the **Hepatitis A & B.**

- Example before starting,,,

A Patient comes with severe jaundice, acute hepatitis, [ALT] is thousands >>> one of the differential diagnosis is **hepatitis C** , Is it ??! That is completely wrong because hepatitis C **does not produce acute infection** so knowing what causes what, is a very important in your practice.

**Now, let's start our topic.**

- There is only two routs for **viral hepatitis transmission** either through Sexual contact , blood transfusion ,injection of drugs & tattoo (parenteral) , so contamination of something that has to be invasive getting into your blood stream Or through the normal contamination (Fecal _oral route).
- It's very important for differentiation to know the route of transmission:

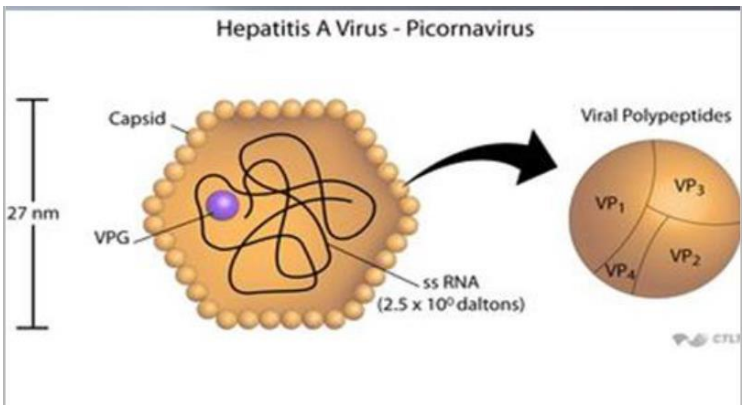
1. Hepatitis A >>>> fecal oral route.
2. Hepatitis B & C >>> Sexual contact , blood transfusion ,injection of drugs , tattoo,,,

# Hepatitis A:

- It's really very common; there are a lot of people that die in hospitals from it. So any recognition is really important.
- if somebody who lived 20 years in Amman, then probably hepatitis A had spread and as young students most of us got it, however because it's fecal oral route and because of hygiene then he didn't get hepatitis A in young age but if he get it in his an adulthood then he will have severe presentation .

❖ **High prevalence** of it in Jordan.

❖ **Structure** :
It's picornavirus, RNA virus, has a capsid (made of polypeptides).




❖ transmitted by fecal/oral route and has a high prevalence .

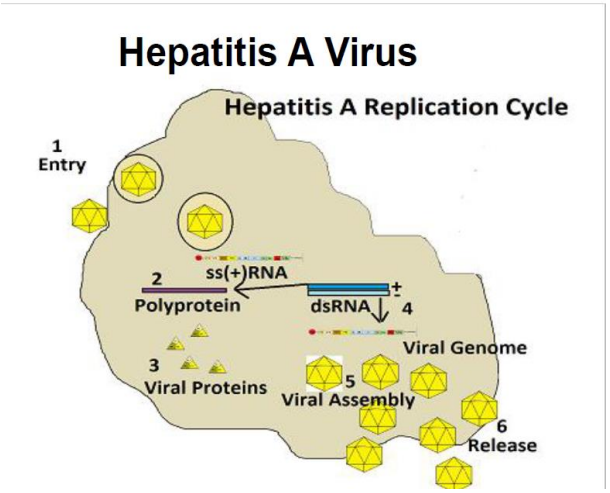
❖ Does it cause **fulminant disease**?!
- ✓ That depend on your **age**; if the patient is young or child the probability to get severe disease is minimal. But if the patient is adult then high chance to get fulminant hepatitis and may die from it.

**NOTE** :
**fulminant disease** : is any event or process that occurs suddenly and quickly, and is intense and severe to the point of *lethality*.

❖ Does it cause **chronic level** disease?!
**NO**, never ever think in patient who has hepatitis A to get chronic hepatitis disease. It's just cause **ACUTE** infection.

❖ In general, the virus has **structural proteins** (that give the form and the structure of the virus) and **nonstructural proteins** (that important in the function and the multiplication of the virus).

❖ **<u>The hepatitis A replication cycle :</u>**
it goes through the cell , multiply there , assembly then released .




❖ As we said the contamination **<u>by the fecal/oral route</u>** rarely transmitted via blood.

**<u>Fecal-oral route :</u>**

When someone gets the virus, the virus will shed into the stool, then he doesn't wash his hand and contaminate food and stuffs and another person eat the food touch the same thing > he'll get the virus

❖ The virus itself **<u>is usually benign</u>**, that means if someone got hepatitis A it'll be **self limited specially for children** but adults will get more sever manifestation but still no chronic level of it; **NO CHRONIC carriers** .

❖ **<u>The presentation depends on how much the virus damage the liver , so we should know the pathogenesis of it ,,,</u>**

- Why do we call it as **hepatitis**?!
  Because they go to the liver, multiply and cause damage there, then inflammation.
- Remember the <u>herpes virus go the ganglion.</u>
- So the pathogenesis of the hepatitis virus :
  1. Ingest the virus.
  2. Replication of the virus in the GI tract.

3. Go to the liver and cause damage and inflammation, it cause jaundice (yellow discoloration on the sclera and skin).As any infection the body produces antibodies against it .

- The hepatitis **itself is not hepatotoxic**; the effect of the virus in liver **is not a direct effect,** it's all about **the immune response** like in hepatitis B; the body try to get rid of the virus and that will cause destruction of the cells .

- The patient could be asymptomatic in children or symptomatic (sever disease) in adult .

- **<u>The clinical features are really important :</u>**
  - The patient will present feeling unwell; if he is smoker, he doesn't want to smoke anymore just because he loses his appetite for that.
  - IP >>> 2-6 weeks.
  - Most of the patient will recover completely with no treat

Up to 2 weeks from the onset of the jaundice the patient can be infectious.

**NOTE** : from the graph it's roughly about 8 days but the doctor say up to 2 weeks for more precaution .

- **<u>Manifestation :</u>**
  1. Jaundice (yellow discoloration on the sclera and skin).
  2. Patient generally weak, fatigue and ill.
  3. Dark urine (because of high billirubin "conjugated and unconjugated "in blood then secreted in the urine itself ).
  4. Nausea and vomiting >>> (The liver will enlarge and inflame, so strict the capsule so patient will present with abdominal pain, nausea and vomiting).

5. Light colored stool. ( that because of cholestasis remember the color of the feces come from the bile acid secretion into the stool , so what happen if there is cholestasis and obstruction of the bile duct so less bile acid will be secreted into the stool so bale stool , that is related to bile salt and stercobilinogen secretion ) .

6. Loss of the appetite.

- **COMPLICATIONS:**

  we said adults may get Fulminant ( severe ) hepatitis but not chronic level. **But** sometimes they may get Relapsing hepatitis by which they have abnormal liver function test for few months and when we test for the virus it will be negative but still abnormal liver . ???! that is actually auto immune phenomena.

- **Diagnosis :**
  - The first thing we should look for is the test **for IgM against hepatitis A**; we don't do feces test or anything else.
  - AST /ALT will go up to 3-5 thousands, (normal level = 40). But it's not specific for hepatitis , it just means there is injury in the liver cell whatever the cause .
  - Billirubin will go up because everything in the liver is destroyed, sever inflammation.
  - The patient may have viremia and the body try to get rid of it .

# Is there a vaccination for hepatitis A? YES.

If you are not sure if you have to take the vaccine or not you just test yourself for antibodies , if you have IgG against hepatitis A so you had been infected by the virus when you was young and no need for vaccination.

However if it's negative and you will travel to area which is endemic with hepatitis A, then you should take the vaccine .

- People who should be vaccinated :
  1. Children .
  2. Men who have sex with men.
  3. People who inject drugs.
  4. People who always travel.
  5. People ( kids and staff ) in nursery .

- To prevent it : hand washing and hygiene .

- **Summary :**
  1. Viral infection .
  2. Fecal/oral route .
  3. IP almost 2-6 weeks .
  4. Self limiting specially in children .
  5. May be Fulminant stage in adults .
  6. Diagnosis by IgM test .

# Hepatitis B :

- **It's very common,** we don't how much the prevalence of it in Jordan may be 10% of the population.
- **The structure :**
  - **DNA** virus.
  - The most complex virus.
  - E antigens.
  - Surface antigens.
  - Core .

- ✓ Note : each one of these structures has its role and a diagnostic value .

  ** **E antigens** give us indication about the activity and the replication of the virus . high E antigen so the virus is active and the **chance to infect another people is high and vice versa** .

  ** **Core** give us an idea about the chronicity of the infection.

  **If there is IgM against the core itself >> acute infection or acute reactivation .**

  **if there IgG >>> chronic infection**.

  ** surface antigens >>> if there is infection or not .

- **<u>Transmission : Parenteral</u>** so injection , sexual contact , blood transfusion .
- Does it cause **<u>chronic disease</u>** ?!
  <u>YES.</u>
- The chance to get rid of the virus in case it's acute infection is almost 95% but 5% will get chronic stage >>> adult .
  if the patient is child or born for mother with hepatitis B and he didn't get the vaccine , the chance to get rid of the virus is almost 85% and 15% to get chronic infection.
- It's oncogenic so hepatitis B itself can cause cancer.
- There are chronic carriers about 4%.
- Symptoms are more common in adults.
- Again, it's associated with acute and chronic hepatitis and hepatocellular carcinoma.
- **<u>WHO IS AT GREATEST RISK FOR HBV INFECTION?</u>**
  1. People who work in medical field (Doctors, nurses,,,)
  2. Patients with HEMODIALYSIS.
  3. Multiple sexual partners.
  4. Drug abusers.

5. LAB PERSONNEL WORKING WITH BLOOD PRODUCTS.
6. People with tattoo.>>> not all tattoos are the same depending on where did you do it !!!

❖ **The hepatitis B replication cycle :**

it goes through the cell , multiply there , assembly then released . it causes destruction of the cell .

- again, most of the damage of hepatitis B is caused by autoimmune process and less cytotoxic effect .

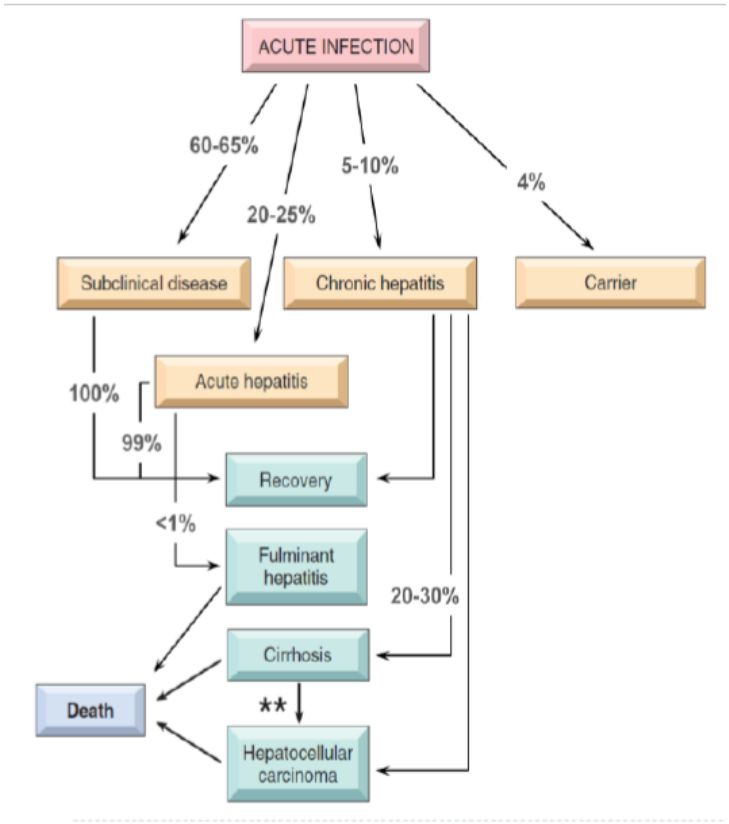
## ❖ Diagnosis :

- How to diagnose it ?!
  remember hepatitis B have surface antigens which are used in the diagnosis.
- If you find anti **hepatitis B surface antigen** ( antibody against the surface antigens ) what does that mean ?!
  the patient don't have hepatitis B now but we have now two possibilities ::
  1. the patient got the virus previously and now he is treated .
  2. the patient is vaccinated .
     in both possibilities he is completely immune.
- Remember : you cannot have the antigens and antibodies at the same time.
- To know the chronicity we look at the **anti core antigen** if IgM is high then it's acute . but if IgG is high then it's chronic infection.
- And as all hepatitis ALT/AST will go up.

## ❖ Pathogenesis :

- If you have anti hepatitis B surface antigens , so you're immune.
- Some will become chronic carrier .it's all about 4-5%. and if the patient is young so the chance will be much higher.

- 5-10% develop to chronic hepatitis, some will develop cirrhosis, hepatocelluar carcinoma, fulminant hepatitis or even recovery.
- 20-25% of patients will develop acute severe hepatitis (patient will come with severe jaundice, high AST/ALT after blood transfusion; this is an indication of acute hepatitis). Less than 1% will develop fulminant hepatitis and 99% recovery .
- Some will be subclinical 60-65%>>> subclinical in children is more common than in adult , usually recovery in 100% of patients .




## ❖ Quick summary :

- ✓ **95% >>> get rid of the virus.** ( some will be subclinical do not know they have the virus , some will have fulminant hepatitis which is severe infection in the liver and may lead to death and some will have little bit symptoms not severe ones)

  **general rule :** more severe infection (more immune response) more chance to get rid of the virus.
- ✓ **5%>>> will** have chronic hepatitis. These people need treatment.

❖ **Phases of the hepatitis B :**

1. **Immune tolerant phase :** the body is tolerating the virus, the virus live in your body without doing anything and the body doesn't kill it; so the ALT is normal while the viral load is high.
   this happens in children , when they get the infection from the mother they will still 10-20 years in this phase. With no problems at all. But at the age of 20 the body decide to attack the virus then enter in the second phase .
2. **The immune clearance phase :** the immune system now try to clean the virus, at that time a lot of inflammation occurs- because of the immune response to get rid of the virus-. So the ALT is going up and the viral load will decrease.
3. **Inactive carrier:** in this phase ALT is down and viral load is down.
4. **Reactivation can occur in the future.**

✓ **hepatitis E antigen** initially it was positive once the body stops react against the virus it will become negative and the body develop anti hepatitis E antigens. That what we call seroconversion.

- Remember >>>
  Seroconversion : produce antibodies against the antigens .

❖ **Manifestation** will be the same as hepatitis A ,btw all kinds of hepatitis present the same >>>jaundice , feeling unwell, nausea , vomiting ,,, etc.

## ❖ Short quiz :P

1. Route of transmission of hepatitis A?!
   Fecal/oral route.
2. How to diagnose hepatitis A?!
   By looking for IgM against hepatitis A.
3. How to diagnose hepatitis B?!
   Looking for the anti surface antigens.
4. What do mean when we say the E antigen test is positive?!
   So the patient is highly infectious (indicate viral replication).
5. The percentage to get acute hepatitis A ?!
   100% ( remember there no Chronic hepatitis A )
6. Who are more sensitive to get fulminant hepatitis A ?!
   Adults.
7. The percentage of fulminant hepatitis A?!
   Rare.
8. The percentage of acute hepatitis B in adults?!
   95%
9. The percentage of patient who develop chronic hepatitis B in adults?!
   5%

Sorry for any mistake^^
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| Virus | Hepatitis A | Hepatitis B | Hepatitis C | Hepatitis D | Hepatitis E |
|---|---|---|---|---|---|
| Type of virus | ssRNA | Partially dsDNA | ssRNA | Circular defective ssRNA | ssRNA |
| Viral family | Hepatovirus; related to picornavirus | Hepadnavirus | Flaviridae | Subviral particle in Deltaviridae family | Hepevirus |
| Route of transmission | Fecal-oral (contaminated food or water) | Parenteral, sexual contact, perinatal | Parenteral; intranasal cocaine use is a risk factor | Parenteral | Fecal-oral |
| Incubation period | 2–6 weeks | 4–26 weeks | 2–26 weeks | Same as for HBV | 2–8 weeks |
| Frequency of chronic liver disease | Never | 10% | ~80% | 5% (coinfection); ≤70% for superinfection | Never |
| Laboratory diagnosis | Detection of serum IgM antibodies | Detection of HBsAg or antibody to HBcAg | PCR assay for HCV RNA; 3rd-generation ELISA for antibody detection | Detection of IgM and IgG antibodies; HDV RNA serum; HDAg in liver | PCR assay for HEV RNA; detection of serum IgM and IgG antibodies |