Epidemiology and Prevention of Viral Hepatitis A to E: Introduction

Division of Viral Hepatitis

CDC
THE LIVER

- WEDGE SHAPED ORGAN
- LOCATED UNDER RIGHT RIB CAGE
- WEIGHS ABOUT 3 LBS.
THE LIVER

- FUNCTIONS OF THE LIVER:
  - MAKES PROTEIN NEEDED FOR BLOOD CLOTTING
  - STORES VITAMINS, IRON AND GLYCOGEN
  - METABOLIZES SUGAR, PROTEIN AND FAT TO PRODUCE ENERGY
  - REMOVES WASTE PRODUCTS AND FILTERS TOXIC SUBSTANCES FROM BLOOD
<table>
<thead>
<tr>
<th></th>
<th>HAV</th>
<th>HBV</th>
<th>HCV</th>
<th>HDV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated infections (x 1000)/year*</td>
<td>93</td>
<td>78</td>
<td>25</td>
<td>6-13</td>
</tr>
<tr>
<td>Fulminant deaths/year</td>
<td>100</td>
<td>150</td>
<td>?</td>
<td>35</td>
</tr>
<tr>
<td>Chronic infections</td>
<td>0</td>
<td>1-1.25</td>
<td>2.7</td>
<td>70,000</td>
</tr>
<tr>
<td>Chronic liver disease deaths/year</td>
<td>0</td>
<td>5,000</td>
<td>8-10,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Acute Viral Hepatitis A, B and C/NANB by Year, United States, 1952-2000

Reported cases per 100,000 population

Year


Hepatitis A
Hepatitis B
Hepatitis C/ NANB
Total

CDC
Centers for Disease Control and Prevention
Viral Hepatitis – Historical Perspective

- "Infectious" transmitted (A)
- Enterically transmitted (E)
- "NANB" (C)
- "Serum" transmitted (B, D)
- Parenterally transmitted (other)

Viral hepatitis types:

- A
- B
- C
- D
- E
# Viral Hepatitis Overview

## Types of Viral Hepatitis

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of virus</td>
<td>feces</td>
<td>blood/blood-derived body fluids</td>
<td>blood/blood-derived body fluids</td>
<td>blood/blood-derived body fluids</td>
<td>feces</td>
</tr>
<tr>
<td>Route of transmission</td>
<td>fecal-oral</td>
<td>percutaneous permucosal</td>
<td>percutaneous permucosal</td>
<td>percutaneous permucosal</td>
<td>fecal-oral</td>
</tr>
<tr>
<td>Chronic infection</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Prevention</td>
<td>pre-exposure immunization</td>
<td>pre/post-exposure immunization</td>
<td>blood donor screening; risk behavior modification</td>
<td>pre/post-exposure immunization; risk behavior modification</td>
<td>ensure safe drinking water</td>
</tr>
</tbody>
</table>
A, B, Cs of Viral Hepatitis

• **A**
  – fecal-oral spread: hygiene, drug use, men having sex with men, travelers, day care, food
  – **vaccine-preventable**

• **B**
  – sexually transmitted – 100x more infectious than HIV
  – blood-borne (sex, injection drug use, mother-child, and health care)
  – **vaccine-preventable**

• **C**
  – blood borne (injection drug use primarily)
  – 4-5 times more common than HIV
  – **NOT vaccine-preventable**!
Acute Hepatitis – Clinical Symptoms

Asymptomatic > Symptomatic > Fulminant Liver Failure > Death

Symptoms (if present) are the same, regardless of cause (e.g., A, B, C, other viruses, toxins)

• Nausea, vomiting
• Abdominal pain
• Loss of appetite
• Fever
• Diarrhea
• Light (clay) colored stools
• Dark urine
• Jaundice (yellowing of eyes, skin)
Hepatitis A Virus
Basics of Hepatitis A

• RNA Picornavirus
  – Single serotype worldwide
  – Acute disease and asymptomatic infection

• No chronic infection
  – Protective antibodies develop in response to infection - confers lifelong immunity
Geographic Distribution of HAV Infection

Anti-HAV Prevalence
- High
- High/Intermediate
- Intermediate
- Low
- Very Low
Reported Cases of Hepatitis A, United States

Source: NNDSS, CDC
### DISEASE BURDEN FROM HEPATITIS A UNITED STATES, 2001

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of acute clinical cases reported</td>
<td>10,609</td>
</tr>
<tr>
<td>Estimated number of acute clinical cases</td>
<td>45,000</td>
</tr>
<tr>
<td>Estimated number of new infections</td>
<td>93,000</td>
</tr>
<tr>
<td>Percent ever infected</td>
<td>31.3%</td>
</tr>
</tbody>
</table>
States with Hepatitis A Rates ≥ 10/100,000 1987-97
Hepatitis A – Clinical Features

- **Incubation period:**
  - Average 30 days
  - Range 15-50 days

- **Jaundice by age group:**
  - < 6 yrs: <10%
  - 6 – 14 yrs: 40%-50%
  - > 14 yrs: 70%-80%

- **Rare Complications:**
  - Fulminant hepatitis
  - Cholestatic hepatitis
  - Relapsing hepatitis

- **Chronic sequelae:**
  - None
Events In Hepatitis A Virus Infection

- Clinical illness
- Infection
- Viremia
- HAV in stool
- ALT
- IgM
- IgG

Week:
0 1 2 3 4 5 6 7 8 9 10 11 12 13

Response:

CDC

Centers for Disease Control and Prevention
Concentration of Hepatitis A Virus in Various Body Fluids

- Feces
- Serum
- Saliva
- Urine

Source: Viral Hepatitis and Liver Disease 1984;9-22
J Infect Dis 1989;160:887-890
Hepatitis A Virus Transmission

• Fecal-oral

• Close personal contact (e.g., household contact, sex contact, child day care centers)

• Contaminated food, water (e.g., infected food handlers)

• Blood exposure (rare) (e.g., injecting drug use, transfusion)
Risk Factors Associated with Reported Hepatitis A, 1990-2000, United States

- Unknown: 46%
- Contact of day-care child/employee: 6%
- Other Contact: 8%
- Sexual or Household Contact: 14%
- International travel: 5%
- Men who have sex with men: 10%
- Injection drug use: 6%
- Child/employee in day-care: 2%
- Food- or waterborne outbreak: 4%

Source: NNDSS/VHSP
Prevention of Hepatitis A

• Vaccination (pre-exposure)
• Immune globulin
• Good hygiene
• Clean water systems; avoidance of food contamination
Hepatitis A Vaccination Strategy: Epidemiologic Considerations

• Many cases occur in community-wide outbreaks
  – no risk factor identified for 40-50% of cases
  – highest attack rates in 5-14 year olds
  – children serve as reservoir of infection

• Groups at increased risk of infection
  – travelers to developing countries
  – men who have sex with men
  – illegal drug users
  – persons with chronic liver disease
ACIP Recommendations – Hepatitis A Vaccine
Pre-exposure Vaccination

• Persons at increased risk for infection
  – travelers to intermediate and high HAV-endemic countries
  – MSM (Men who have sex with men)
  – illegal drug users
  – Persons who have clotting factor disorders
  – persons with chronic liver disease

• Communities with historically high rates of hepatitis A
  -routine childhood vaccination
Duration of Protection after Hepatitis A Vaccination

- Persistence of antibody
  - At least 5-8 years among adults and children

- Efficacy
  - No cases in vaccinated children at 5-6 years of follow-up

- Mathematical models of antibody decline suggest protective antibody levels persist for at least 20 years

- Other mechanisms, such as cellular memory, may contribute
COMBINED HEPATITIS A
HEPATITIS B VACCINE

- Approved by the FDA in United States for persons ≥18 years old
- Contains 720 EL.U. hepatitis A antigen and 20 µg. HBsAg
- Vaccination schedule: 0, 1, 6 months
- Immunogenicity similar to single-antigen vaccines given separately
- Can be used in persons ≥ 18 years old who need vaccination against both hepatitis A and B
- Formulation for children available in many other countries
Hepatitis A in the United States-2002

• National rate lowest yet recorded
  – Continued monitoring needed to determine if low rates sustained and due to vaccination
  – Evaluation of age-specific rates to assess impact of vaccination strategy

• Rates increasing in some states
  – Occurring among adults in high risk groups (e.g. MSM, drug users)
Hepatitis A Incidence, United States

1987-97 average incidence

2002 incidence

Rate per 100,000

- > = 20
- 10 - 19
- 5 - 9
- 0 - 4
Lack of integrated prevention activities leads to...

- Individuals infected with HIV, hepatitis and other STDs remain undiagnosed, untreated and uninformed.

- Infected and uninformed have higher levels of risky behavior and continue to transmit.

- Counseling is mistakenly based on limited diagnosis and individuals at risk for HAV and HBV don’t get immunized.
Long-term Hepatitis A Prevention Strategy

• Sustain ongoing vaccination

• Lower disease incidence
  – Catch-up vaccination of children and adolescents

• Further reduce incidence
  – Vaccination of high-risk adults
  – Routine vaccination of children nationwide