The Main Modes of HBV Transmission in Children, Central Asian Region

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Hepatitis B Virus

• Circular DNA genome

• Member of the family of Hepadnaviridae

• Nucleocapsid proteins including HBcAg and HBeAg; envelope proteins
Geographic Distribution of Chronic HBV Infection

HBsAg Prevalence
- ≥8% - High
- 2-7% - Intermediate
- <2% - Low

CDC (Centers for Disease Control and Prevention)
Geographic distribution of chronic HBV and HDV infection in Eastern Europe and Former USSR.

[Map showing prevalence rates of HBsAg and Anti-HDV in different regions.]
Differences in Age at Acquisition of Chronic HBV Infections by Endemicity

Low HBsAg Prevalence

- Adult: 54%
- Perinatal: 25%
- Early Childhood: 11%
- Adolescents: 10%

Perinatal and early childhood infections: 30-40%

High HBsAg Prevalence

- Adult: 5%
- Perinatal: 25%
- Early Childhood: 60%
- Adolescents: 10%

Perinatal and early childhood infections: 70-80%
Symptomatic Infection

Chronic Infection

Age at Infection

Chronic Infection (%)

Symptomatic Infection (%)

Birth 1-6 months 7-12 months 1-4 years Older Children and Adults

Outcome of HBV Infection by Age at Infection
# Sources of Hepatitis B Virus Infection

**High or Intermediate Endemicity Countries**

<table>
<thead>
<tr>
<th>Age</th>
<th>Route/source of Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>Mother - perinatal infection</td>
</tr>
<tr>
<td>Early childhood</td>
<td>Inapparent parenteral (horizontal)</td>
</tr>
<tr>
<td>(1- 5 years)</td>
<td>Direct parenteral - injections, nosocomial, transfusion</td>
</tr>
<tr>
<td>Childhood</td>
<td>Inapparent parenteral (horizontal)</td>
</tr>
<tr>
<td></td>
<td>Direct parenteral - injections, nosocomial, transfusion</td>
</tr>
<tr>
<td>Adolescent/Adult</td>
<td>Sexual</td>
</tr>
</tbody>
</table>
Chronic Hepatitis B Prevalence, prior to HepB Vaccination, Uzbekistan, 1999-2000

Risk factors and seroprevalence of hepatitis B virus, hepatitis C virus and HIV infection in Uzbekistan, R.Ruzaibakiev and coll.
Distribution of Chronic HBV Infection by Age Groups before Immunization, Osh, Kyrgyzstan, 1989

N=2019
Distribution of HBV Infection by Age Groups before HepB Vaccination, Osh, Kyrgyzstan, 1989

N=2019

%
Age of Acquisition of Chronic HBV Infection in High Endemic Areas

High HBcAg (40%)

- Early Childhood
- Adult
- Perinatal

Low HBcAg (10%)

- Early Childhood
- Adolescent
### Risk of Perinatal HBV Transmission by HBeAg Serostatus of Mother

<table>
<thead>
<tr>
<th>Serostatus of Mother</th>
<th>Infants Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HBsAg</strong></td>
<td><strong>HBeAg</strong></td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>
HBeAg and anti-HBe Prevalence in Central Asia, Osh, Kyrgyzstan, 2005

N=73

<table>
<thead>
<tr>
<th>Percentage</th>
<th>HBeAg</th>
<th>anti-HBe</th>
</tr>
</thead>
<tbody>
<tr>
<td>24.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N=73
HBeAg and antiHBe Prevalence by Age, Central Asia, Kyrgyzstan, 2005
Hepatitis D Virus

• Diameter 35-37 nm
• Circular single stranded RNA
• Depends on HBV replication
Hepatitis D Virus

Acquisition of Infection

- Coinfection
  - Simultaneous inoculation of HDV and HBV
- Superinfection
  - Inoculation of HBV into HBsAg-positive host
Case Fatality Rate of Acute HBV and HDV Infection Among Children under 14, Uzbekistan, 1995

P = 0.001

HBV (n=166) HBV+HDV (n=55)
HBV, HBC and HDV Infection among Children with Chronic Liver Diseases. Ashgabad, Turkmenistan, 1992-1995

- HBV: 16.7%
- HBV+HCV: 2.6%
- HDV: 30.8%
- HDV+HCV: 1.3%
- Cryptogenic: 32.1%
Estimated Acute VH and Chronic Liver Diseases Mortality prior to vaccination, Central Asia, 1991-1998
Years of Potential Life Lost for different causes, Uzbekistan, 1987

- Болезни сердца
- Рак
- Травмы
- О.пневмонии
- ОРИ
- ОКИ
- ВГ

The chart shows the years of potential life lost due to various causes in Uzbekistan in 1987.
YPLL for Significant Death Causes, Kyrgyzstan, 2000

- Respiratory diseases
- Trauma
- Coronary diseases
- Cancer
- TB
- Diarrhea
- Chronic liver diseases
- Psychiatric diseases
- Diabetes
### Risk Factors of Hepatitis B, Kyrgyz Sentinel Surveillance, Children under 5, 2000-2005

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Frequency (N=1556)</th>
<th>OR</th>
<th>Confidence interval CI_{0.95}</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases (66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>8.5%</td>
<td>0.5%</td>
<td>19.7</td>
<td>[5.5; 70.2]</td>
</tr>
<tr>
<td>Injections in hospital</td>
<td>22.0%</td>
<td>6.0%</td>
<td>4.4</td>
<td>[2.3; 8.6]</td>
</tr>
<tr>
<td>Injections in outpatient settings</td>
<td>13.3%</td>
<td>4.7%</td>
<td>3.1</td>
<td>[1.4; 6.8]</td>
</tr>
</tbody>
</table>
# Risk Factors of Hepatitis B, Kyrgyz Sentinel Surveillance, Children under 2, 2000-2005

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Frequency (N=595)</th>
<th>OR</th>
<th>Confidence interval CI_{0.95}</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases (34) Controls (511)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>16.7% 0.8%</td>
<td>25.7</td>
<td>[5.7; 113.6]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Injections in hospital</td>
<td>33.3% 8.2%</td>
<td>5.6</td>
<td>[2.4; 12.9]</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Conclusions (1)

- Central Asia region was highly endemic on viral hepatitis B and D
- The high prevalence of hepatitis B and D infection leads to high morbidity and mortality from acute viral hepatitis and chronic liver diseases
Conclusions (2)

- The high prevalence of HBeAg careers among women with chronic HBV infection results in high prevalence of mother to child transmission
- High proportion of infants and children at early childhood acquire HBV and HDV infections at health care settings
Recommendations

- Provide sustainable implementation of universal newborn Hep B immunization programs
- Pay particular attention to the timely and proper introduction of the HepB birth dose
  - Trainings and education of neonatologists
  - Immunization of newborns delivered at home