An Outbreak of Hepatitis A Among Primary and Secondary Contacts of an International Adoptee

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SYNOPSIS

The Advisory Committee on Immunization Practices recommends that susceptible people traveling to developing countries receive hepatitis A vaccine or immune globulin prior to departure. Until 2009, the recommendations did not address non-traveling family members or other close contacts of international adoptees. We report an outbreak of hepatitis A in 2008 that occurred in Maine.

Eight members of an extended family developed hepatitis A following the arrival of an asymptomatic infant from Ethiopia who was brought to the United States by an adoption agency. Two children in the family attended an elementary school where five additional cases of hepatitis A were subsequently identified. Only three (1%) of 208 students at the school had previously been immunized against hepatitis A. This outbreak highlights the need to immunize household members and other close contacts of families adopting children from countries where hepatitis A is endemic, as well as all children at one year of age.

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Hepatitis A virus (HAV) is primarily transmitted by the fecal-oral route. The average incubation period is 28 days (range: 15–50 days).¹ The majority of infections are asymptomatic in young children, while symptoms are more common among older children and adults.² Approximately 33% of people with reported cases of hepatitis A are hospitalized; hospitalization rates increase with increasing age.³ Overall mortality among reported cases of hepatitis A is approximately 0.3%–0.6%; however, among adults older than 50 years of age, mortality is 1.8%.¹

Travel to developing countries with high rates of hepatitis A can place residents of the United States and other countries with lower endemicity of HAV at risk for infection.¹ Maine historically has had a low incidence of hepatitis A. From 2002 through 2007, a mean of 10.8 cases per year of hepatitis A was reported in the state (0.8 cases/100,000/year). Since 1996, the Advisory Committee on Immunization Practices (ACIP) has recommended that susceptible people traveling to developing countries receive hepatitis A vaccine or immune globulin prior to departure.^{1,4} Prior to 2009, ACIP recommendations did not address non-traveling family members or other close contacts of international adoptees. In the U.S., transmission of HAV occurs most often among close contacts, especially in household settings; child-to-child transmission in schools is relatively uncommon.¹ We investigated an outbreak of hepatitis A in Maine that occurred in an extended family following the adoption of an infant from Ethiopia, and that subsequently spread to students in an elementary school.

METHODS

By law, hepatitis A is a reportable disease in Maine. Reports are received from laboratories, hospitals, and health-care providers. All suspect cases are assigned to an epidemiologist with the state health department for investigation using a standard protocol.

A case of hepatitis A was defined using the 2000 Council of State and Territorial Epidemiologists/Centers for Disease Control and Prevention case definition as an acute illness with (1) discrete onset of symptoms, (2) jaundice or elevated serum aminotransferase levels, and (3) positive immunoglobulin M (IgM) antibody to HAV, or an epidemiologic link with a person who had laboratory-confirmed hepatitis A.⁵ Case finding was enhanced by three health alerts issued to health-care providers by the state health department and local media coverage.

RESULTS

On September 11, 2008, the index case, a mother of six children (family A), became ill. A week later, she was admitted to a hospital and diagnosed with hepatitis A. The state health department was notified by a laboratory on September 19 that the woman had a positive anti-HAV IgM result. She developed fulminant hepatitis and was transferred out of state to a tertiary care facility. Five of her six children living at home were subsequently diagnosed with hepatitis A, with onset dates ranging from September 11 to September 29 (Table). The sixth child at home was an infant adopted from Ethiopia in mid-August 2008 at 10 months of age. None

Table. Characteristics of case patients in an outbreak of hepatitis A in Maine, 2008

Case patient	Age (in years)	Relationship ^a	Date of onset	Date of diagnosis	School
1	49	Parent of #2–6	9/11/08	9/18/08	NA
2	23	Child of #1	9/11/08	10/2/08	NA
3	3	Child of #1	9/24/08	10/2/08	Preschool
4	2	Child of #1	9/28/08	10/2/08	NA
5	8	Child of #1	9/29/08	10/2/08	School X—third grade
6	6	Child of #1	9/29/08	10/2/08	School X—kindergarten
7	10	Schoolmate of #5–6	10/17/08	10/24/08	School X—fifth grade
8	41	Relative of #1–6	10/23/08	10/28/08	NA
9	14	Relative of #1–6	10/23/08	10/28/08	School Y—fifth grade
10	8	Schoolmate of #5–7/classmate of #5	11/4/08	11/7/08	School X—third grade
11	7	Schoolmate of #5–7, 10	11/10/08	11/14/08	School X—first grade
12	6	Schoolmate of #5–7, 10–11	11/18/08	11/24/08	School X—first grade
13	6	Schoolmate of #5–7, 10–12/sibling of #11	11/25/08	11/25/08	School X—kindergarten

^aRelationships listed for schoolmates and siblings are restricted to case patients with earlier onset of illness.

NA = not applicable

of the family traveled overseas for the adoption; the child was brought to the U.S. by a staff member of an adoption agency. The staff member had been previously immunized against HAV and did not become ill. The child was asymptomatic. Upon testing on October 2, 2008, the infant was positive for IgM antibody to HAV. A stool sample from October 4 was positive for *Giardia lamblia*. The child reportedly had intermittent loose stools but no clearly defined diarrheal illness.

Two members of the extended family became ill with hepatitis A on October 23. Both individuals had assisted in caring for the children of the index case after her hospitalization. Neither had received post-exposure prophylaxis, as they had not been identified during the initial contact investigation of family A by the state health department. One of the extended family members was an adult and required hospitalization. The other extended family member attended high school. No additional cases of hepatitis A were identified in the high school.

Two of the children in family A attended a local elementary school (school X) in kindergarten and

third grade. On October 24, a fifth grader at the school was diagnosed with hepatitis A. No links between this child and family A outside of the school setting could be identified. Assuming the fifth grader was infected in the school setting, the state health department held a hepatitis A immunization clinic at the school on November 6. Hepatitis A immunization was offered at no charge to all students ($n=208$) and staff ($n=51$) at the school. Only three (1%) students reported a prior history of hepatitis A immunization. A total of 158 (76%) students and 50 (98%) staff were immunized during the clinic. By November 25, school nurses and private providers had immunized another 15 (7%) students. Four additional students at the school, of which only one was a classmate of a previous case, were subsequently diagnosed with hepatitis A from November 7 through November 25 (Figure).

In addition to immunization of students and staff at school X, control measures included improved hand hygiene and environmental initiatives. Hand hygiene was enhanced through educational efforts and installation of alcohol gel dispensers throughout the school.

Figure. Cases in outbreak of hepatitis A by week of illness onset in Maine, 2008

Environmental efforts included cleaning and disinfecting commonly used items such as computer keyboards and temporarily discontinuing the self-service salad bar in the school's cafeteria.

After the initial investigation, it was determined that one child of family A attended a local preschool. All children at the preschool were 3 to 5 years of age; none were in diapers. Only one of the students or staff at the preschool reported previous receipt of hepatitis A vaccine. An immunization clinic was held at the preschool on November 12. Nine (47%) of 19 children and one (33%) of three staff were immunized. No additional cases of hepatitis A were identified at the preschool or among family members.

None of the ill individuals in this outbreak had received hepatitis A vaccine more than a week prior to illness onset, except for a 6-year-old female with illness onset on November 25. She attended school X and was immunized on November 6. Her older brother had become ill with hepatitis A on November 10. All ill individuals made full recoveries.

On May 15, 2009, another hepatitis A immunization clinic was held at the school to deliver the second dose of the vaccine. Students and staff of the preschool were invited to attend. A total of 149 (72%) students and 52 (102%) staff of the elementary school were immunized at the clinic. Another four (2%) students and seven (14%) staff of the school were immunized by the school nurse during the following week. A second dose of vaccine was administered to four (21%) students from the preschool during the clinic.

DISCUSSION

The findings from this outbreak investigation suggest that an adopted infant transmitted HAV to family members that resulted in the subsequent transmission of infection among students at a local elementary school. The adopted infant was thought to be the primary case in this outbreak for several reasons: (1) a positive test of HAV IgM, (2) recent arrival from a country with high HAV endemicity, (3) an interval between arrival and illness onset in the family that was consistent with the average incubation period of hepatitis A, (4) the absence of preexisting HAV infections in the surrounding community prior to the infant's arrival, and (5) the lack of other risk factors for hepatitis A in the adoptee's family.

Hepatitis A is highly endemic in Ethiopia and most regions in the developing world. In one study from Ethiopia, 66% of children aged one to 5 years were shown to be anti-HAV positive. Only 41 (5%) of 787 of children of all ages in this study were reported to

have had a history of jaundice.⁶ This is consistent with studies in the U.S. showing that 84% of children aged one to 2 years with hepatitis A were asymptomatic.² The clinical impact of hepatitis A is much greater among older children and adults, as evidenced by the two adults in family A who required hospitalization.

Relatively few reports of HAV transmission in low-incidence countries involving asymptomatic children from countries in which infection is endemic have been published.^{7–10} Of these, only two reports involved hepatitis A in non-traveling contacts of international adoptees.^{9,10} In the first report, a 36-year-old French woman developed hepatitis A from an asymptomatic 18-month-old child adopted from Ethiopia.⁹ In the second report, a 51-year-old American woman developed hepatitis A after interacting with her one-year-old adopted twin grandchildren from Ethiopia.¹⁰

The costs of the investigation and control measures for this outbreak were not determined. Only a few hepatitis A outbreaks have undergone economic analysis. A recent review found that costs ranged from \$3,824 to \$200,480 per case of hepatitis A in outbreak settings.¹¹ Costs for outbreaks in schools were toward the lower end of this range.^{12,13} Besides the financial burden of hepatitis A outbreaks, arranging mass clinics on short notice for post-exposure prophylaxis can be a major challenge to public health departments. Recent efforts to prepare for pandemic influenza and smallpox may provide useful guidelines for organizing this type of immunization effort.¹⁴

Limitations

There are at least three important considerations in reviewing the findings of this outbreak investigation. First, due to the high prevalence of asymptomatic HAV infections among young children, it is likely there were additional infections and that this investigation represents a minimal estimate of the magnitude of the outbreak. Second, we were unable to obtain appropriate specimens for molecular testing of HAV that would have further characterized the virus involved in this outbreak, including its likely geographic origin. Third, some individuals may have obtained hepatitis A immunization from private providers. Immunization rates after each of the clinics therefore represent minimum estimates of actual coverage.

CONCLUSION

Family members who travel for adoptions to countries that have high or intermediate hepatitis A endemicity have been advised to receive vaccine or immune globulin prior to departure.^{1,15} In 2009, ACIP recommended

hepatitis A vaccination for all previously unvaccinated people who anticipate close personal contact with an international adoptee from countries of high and intermediate endemicity during the first 60 days following arrival in the U.S.¹⁶ Since 2006, ACIP has recommended that all children in the U.S. receive hepatitis A vaccine at one year of age. In areas such as Maine, catch-up vaccination for children aged 2 to 18 years can be considered.¹ Improved compliance with this recommendation is needed in many communities with a large population of susceptible individuals due to the absence of previous HAV infection or immunization.

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