Outbreak of Hepatitis A in Korean Military Personnel

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SUMMARY: This report describes a hepatitis A outbreak among Korean military personnel. Each case of hepatitis A in this outbreak was defined as a person who had symptoms compatible with acute viral hepatitis A and had positive HAV IgM between May 2 and August 14, 2007 in Inje district, Gangwon, Korea. We tested 70 cases with symptoms for HAV IgM, and 67 cases showed positive results. They included 4 sergeants, 1 officer and 62 privates. A positive result for HAV IgG among asymptomatic military personnel was seen in 11.8% of cases. This epidemic occurred after a heavy rainfall in the military compound area where drinking water was supplied by the stream water. After the outbreak, the supply of drinking water was switched to a public water system. All of 178 military personnel who had no HAV IgG were vaccinated on July 26, 2007. The outbreak was resolved after the control measures were implemented.

In developing countries, exposure to HAV usually occurs before the age of 10 years (1). With improving socioeconomic conditions, such countries have entered a transitional phase in which the virus is still prevalent in the population but hygienic conditions are improving, and the average age of infection has been delayed (1-3). The incidence of hepatitis A in Korea during recent decades has decreased as sanitation and living standards have improved rapidly along with the dramatic economic growth of the nation (4). Simultaneously, the overall seropositive rate of hepatitis A virus (HAV) IgG in subjects under 20 years of age has rapidly decreased from 63.8% in 1979 to 4.6% in 1996 (4,5). Two other recent seroprevalence studies of anti-HAV IgG among young Korean soldiers and auxiliary police officers showed seroprevalence rates of 2 and 0.6%, respectively (6,7). In fact, there have been several reports of hepatitis A outbreaks in adults and children (4,6-10). Recently, we experienced a hepatitis A outbreak among Korean military personnel. We investigated the characteristics of this hepatitis A outbreak and performed a serologic examination to determine if selective HAV vaccination for this particular age group was necessary.

In this outbreak, a case of hepatitis A was defined as a person who had symptoms compatible with acute viral hepatitis A and had positive HAV IgM between May 2 and August 14, 2007 in Inje district, Gangwon, Korea (11). On July 23, 2007, we tested for HAV IgM and IgG antibody using a Modular Analytics E170 (Roche, Basel, Switzerland) in 204 consenting persons who were exposed to HAV in order to estimate their status of susceptibility. We tested 70 cases with symptoms for HAV IgM, and 67 cases showed positive results (Table 1). The mean age of the 67 patients was 21.7 ± 2.1 (range 19-33) years. The patients included 4 sergeants, 1 officer and 62 privates. The most frequently reported symptoms included nausea (74.6%), anorexia (74.6%), headache (71.6%), jaundice (67.2%), abdominal pain (65.7%), fever (61.2%), chills (55.2%), vomiting (44.8%), diarrhea (41.8%), flu-like symptoms (25.4%), myalgia (22.4%) and arthralgia (9.0%). The prevalence of HAV IgG among asymptomatic military personnel was 11.8% (24 among 204 persons).

The low incidence of natural infection clearly indicates that a large part of the younger population is susceptible to HAV infection unless they acquire proper immunity (4). Nationwide surveys conducted of hepatitis A patients were conducted using HAV IgM antibody in 85 hospitals during the period from July 1996 to June 1998 in Korea. The age distribution of the reported cases of hepatitis A indicated that the majority of patients were in their late teens or young adulthood (4). In this report, the mean age of the military personnel with hepatitis A was 21.7 ± 2.1 (range 19-33) years, which was very similar in its age distribution to the cases previously reported (4).

In this study, hepatitis A cases occurred sporadically among military personnel before June 30, 2007 (Figure 1). Then 4 more cases followed within a very short period, and this prompted a military physician who worked for the local military hospital to request the military headquarters to investigate whether the hepatitis A cases occurring around July 11, 2007, constituted an outbreak.

We could exclude the possibility of influx from the local community because the first case who presented his symptoms on May 2 had his last vacation from December 25, 2006 to January 3, 2007. Moreover, there were no reports of HAV in Inje district from May to August 2007. We could not thoroughly investigate individual food intake. However, we excluded foods as the infectious source because several corps stationed nearby had taken foodstuffs from the same supply base, but HAV cases were reported only in this corps. The water supply system of the corps was divided in two: the water for drinking was filtered by several membranes and
reserved in a water tank, but the water for general use was not filtered. The military personnel used the filtered water for drinking, but they bathed and brushed teeth with non-filtered water. According to the Korean Meteorological Administration (data are available at http://www.kma.go.kr/sfc/sfc_03_02.jsp), there was a small amount of rainfall from early to mid-April in 2007, and the water level of the stream gradually went down at that time. On April 20, 2007, there was a heavy rainfall of 14 mm, which elevated the water level rapidly. On May 14, 2007, a sample was collected from the military water supply by the Korea Environment and Water Works Institute to determine the level of water contamination. The report came back on May 31, 2007, and reported a bacterial count of 2,200 per ml and the presence of colo bacillus. Epidemiologic evidence that HAV is readily transmitted by sewage-polluted drinking water and sewage-polluted recreational water is well documented (12-14). Villar et al. (15) reported that there was a seasonal variation of HAV infection during the hot season relating to the large amount of rain. We postulated that the first case was because of the contamination of water with sewage due to the heavy rainfall of April 20, 2007. After the first case, 4 more cases occurred sporadically on the military post. The presumptive index case in the second outbreak worked for the military cafeteria. After June 25, the occurrence of HAV cases increased explosively, and the peak of the second outbreak was seen from July 20 to July 30. We concluded that a food service worker had been the source of the second outbreak.

The outbreak area was confined to one military post, which had used water from a nearby stream in Inje district, Gangwon province. All members of the unit had been using one mess hall. The unit had two purifier systems, one for drinking and the other for washing. While the drinking water had been filtered using several membranes, the water for washing was only treated using a sedimentation system. To produce the epidemic curve in two different patterns, we presumed that there were two infectious sources in this outbreak, namely one for the first outbreak (from May 2 to June 10) and one for the second outbreak (after June 25). Beginning July 16, 2007, we applied the following control measures: drinking water was supplied by a public water service, and a mobile purifier truck provided the water for washing. We checked all asymptomatic military personnel stationed in the same military post for HAV IgG. The prevalence of HAV IgG in asymptomatic military personnel was 11.8% (24 among 204 persons). We vaccinated all 178 persons from July 26 to 27, 2007. However, 34 more cases occurred after the vaccination on July 26, 2007. It was speculated that they were in a window period and had already been in an infectious state at the time of the vaccination. The outbreak ended after August 15, 2007.

This study was not without limitations. We could not provide detailed geographic information because of military restrictions and could not apply a molecular epidemiologic approach to HAV. This HAV outbreak among Korean military personnel in association with water pollution after a heavy rainfall could possibly be due to the low HAV antibody present in this particular age group in the military. A food service worker was the index patient in the second outbreak. Cases of HAV are on the rise, and several outbreaks have been reported in recent years among the younger age group in Korea. As a result of this study, we highly recommend HAV vaccination for high-risk groups such as military personnel, especially food service workers.

REFERENCES