Seroepidemiology of Hepatitis A in South Korea: A Nationwide Study by the Eone Reference Laboratory

Sung Eun Cho and Youngdae Kim

1Eone Reference Laboratory, Seoul, South Korea
2Department of Pediatrics, Seoul Paik Hospital, College of Medicine, Inje University, Seoul, South Korea

Received October 19, 2012; accepted February 13, 2013; released online April 27, 2013

ABSTRACT

Background: We evaluated the recent prevalence of serologic markers of hepatitis A virus (HAV) in South Korea.

Methods: The study data were the results of 60,126 anti-HAV (total) tests and 30,786 anti-HAV IgM tests that were performed during April 2009 through March 2010 by the Eone Reference Laboratory at the request of 1935 institutions throughout Korea.

Results: The overall positivity rate was 51.06% on the anti-HAV (total) test and 11.20% on the anti-HAV IgM test. As compared with the other age groups the rate of anti-HAV (total) positivity was significantly lower (P < 0.001), and the rate of anti-HAV IgM positivity was significantly higher (P < 0.001), among Koreans aged 11 to 40 years. The seroprevalence of anti-HAV IgM significantly differed according to region but not by referral date.

Conclusions: This was the largest nationwide study in South Korea by 1 laboratory, and it provides useful recent baseline data on hepatitis A in Asia. The findings suggest that active immunization of younger Koreans should be made a priority.

Key words: hepatitis A virus; South Korea; immunization

INTRODUCTION

Hepatitis A is an acute, typically self-limiting liver disease and is one of the most common infectious diseases in the world. The hepatitis A virus (HAV) is a member of the Picornaviridae family of small, nonenveloped, single-stranded RNA viruses. HAV infection occurs primarily by oral inoculation of fecally excreted virus, either by person-to-person contact or by ingestion of contaminated food or water.

HAV infection is highly endemic in developing nations with poor sanitation, where infection often occurs in children. In developed nations, the proportion of symptomatic patients is higher because infection is more likely in adults. The presence and severity of symptoms associated with HAV infection is related to patient age. Approximately 70% of infected adults develop symptoms, including jaundice. In contrast, only 30% of children younger than 6 years develop symptoms, which are usually nonspecific and flu-like, without jaundice.

In Korea, rapid economic development has caused a rapid epidemiologic shift in HAV infection. Since the late 1990s, the number of patients with HAV infection has markedly increased in Korea, especially among those aged 20 to 40 years, most likely due to the lower rate of anti-HAV IgG positivity in this age group.

The rising prevalence of HAV infection has led to an increase in the number of requests for HAV serologic tests. To establish programs that are effective in preventing HAV infection, a nationwide epidemiologic study of anti-HAV seroprevalence is needed. Thus, we investigated recent nationwide epidemiologic data on anti-HAV seroprevalence in Korea in relation to sex, age group, region, and referral date.

METHODS

The results of 60,126 anti-HAV (total) tests and 30,786 anti-HAV IgM tests that were performed during April 2009 through March 2010 by the Eone Reference Laboratory at the request of 1935 institutions throughout Korea were evaluated with respect to sex, age group, region, and referral date. The subjects were divided into 7 age groups (0–10, 11–20, 21–30, 31–40, 41–50, 51–60, >60 years). Region was classified according to the 7 provinces of South Korea, namely,
Results

The overall rate of positive test results was 51.06% for anti-HAV (total) and 11.20% for anti-HAV IgM. The rate of anti-HAV (total) positivity did not significantly differ between males and females (52.86% vs 49.44%, P = 0.560); however, the rate of anti-HAV IgM positivity was higher among males than among females (13.35% vs 8.82%, P = 0.020; Table 1).

As compared with the other age groups, the rate of anti-HAV (total) positivity was significantly lower (P < 0.001), and the rate of IgM anti-HAV positivity was significantly higher (P < 0.001), in the age groups encompassing individuals aged 11 to 40 years (Table 2). The rate of anti-HAV (total) positivity was 55.48% in the age group 0 to 10 years, which was higher than in the age groups that included individuals aged 11 to 40 years. The rate of anti-HAV (total) positivity was greater than 90% in the age groups 41 to 50 years, 51 to 60 years, and 61 years or older. Most importantly, there was a trend toward an inverse relation between rate of anti-HAV (total) positivity and anti-HAV IgM positivity in all age groups (Table 2).

The seroprevalence of anti-HAV IgM significantly differed according to region and was higher in Seoul, Gyeonggido/Incheon, and Gangwondo (P = 0.023) (Table 3; Figure). Prevalence rates did not significantly differ according to referral date during the 1-year period from April 2009 through March 2010 (Table 4).

Discussion

Although a number of studies have examined anti-HAV seroprevalence in Korea,6–24 they were restricted to specific regions or age groups. We conducted a nationwide epidemiologic study of recent anti-HAV seroprevalence in Korea to establish effective measures to prevent HAV infection.

Overall seroprevalence was 51.06% for anti-HAV (total) and 11.20% for anti-HAV IgM. These values confirm those reported in previous studies of the Korean population. In those studies the positivity rates for all age groups combined were 45.7% to 62.8% for anti-HAV (total)6,9,10 and 11.0% for anti-HAV IgM.10

The positivity rate for anti-HAV IgM was higher in males than in females in this study (13.35% vs 8.82%, P = 0.020), which also confirms earlier findings in Korea.10,15

Acknowledgments

This study was supported by the research fund of Ewha Womans University.
previous study, the male-female ratio was 1.2:1.0 during the period 1988–1998 among children living in Gyeonggido province.15 The rate of anti-HAV IgM positivity was higher in males than in females (11.8% vs 10.0%, \( P < 0.0001 \)) in an epidemiologic study analyzing a recent 4-year period (2005–2008).10 In another study, the male predominance in prevalence was explained by the greater frequency of virus exposure among young men.6 However, as compared with previous studies of Koreans, we observed a marked predominance in prevalence among males. Because this is the most recent analysis of Korean data, this trend toward male predominance in HAV infection is likely to continue in the near future in Korea.

In accordance with the lower rate of anti-HAV (total) positivity, as compared with other age groups, the prevalence of acute hepatitis A infection (as indicated by the presence of anti-HAV IgM) was higher in the age groups that included individuals aged 11 to 40 years. HAV seroepidemiology in Korea is rapidly changing, and a growing number of young adults are susceptible to HAV infection.9 The decrease in HAV infection among young adults has resulted in fewer individuals with natural immunity and a consequent increase in the adult population at risk of contracting the disease.16 This is supported by several previous studies in Korea.6–13

In 1 study, the seroprevalence of anti-HAV (total) was very low among teenagers and those aged 20 to 29 years, higher among adults aged 30 to 39 years, and greater than 90% among older adults. Most people with HAV hepatitis were aged 20 to 39 years.6 In another study, the annual rate of anti-HAV (total) positivity was significantly lower among adults 21 years or older during a recent 4-year period (2005–2008), but the rate of anti-HAV IgM positivity showed an increasing trend.10

Interestingly, the positivity rate was lowest among those aged 20 to 29 years in the present study, which suggests an increased risk of hepatitis A outbreaks among military personnel, as was previously reported.17,18 The male predominance in anti-HAV IgM is additional evidence of such outbreaks. Korea has a military draft system, and men in their early 20s are required to serve in the armed services. Military personnel are considered to be at higher risk for HAV infection as compared with the civilian population.19 The seroprevalence of anti-HAV IgG among those aged 24 years or younger was 4.7% in a previous study of Korean military personnel.20 However, the HAV vaccination rate was very low among military soldiers.19 These findings indicate a need to strengthen requirements for military HAV vaccination programs.
Among adults aged 40 years or older, the rate of anti-HAV (total) positivity was greater than 90%, which indicates that natural immunity helps lower the seroprevalence of anti-HAV IgM. This is explained by the cohort effect, ie, the parallel shift during the past 20 years of age groups that possess the antibody, and reflects the fact that hepatitis A was once endemic in Korea.

The rate of anti-HAV (total) positivity was 55.48% among children younger than 10 years, which is the result of vaccination. Other studies have also observed an anti-HAV seroprevalence greater than 50% in the same age group. Routine childhood vaccination in Korea would aid in preventing and eradicating acute hepatitis A in the near future.

The seroprevalence of anti-HAV IgM significantly differed according to region: it was higher in Seoul, Gyeonggido/Incheon, and Gangwondo than in the other regions \( (P = 0.023) \). Both socioeconomic status and the ratio of residents aged 11 to 40 years are highest in Seoul and Gyeonggido/Incheon, which contributed to the higher seroprevalence of anti-HAV IgM in these regions. These findings are consistent with those of a previous study by the Korean Centers for Disease Control and Prevention (KCDC). However, another study found that anti-HAV IgM seroprevalence was not high in Gangwondo. Gangwondo has a large number of Korean military personnel, most of whom are male and in their 20s. The low seroprevalence of anti-HAV (total) among younger military personnel contributes to the higher seroprevalence of anti-HAV IgM in Gangwondo. There is also the possibility that HAV outbreaks have occurred among military personnel.

Prevalence rates did not significantly differ according to referral date, indicating no difference in the seasonality of hepatitis A, which is consistent with findings from previous studies.

When the seroprevalence of anti-HAV (total) is high, selective vaccination according to anti-HAV serostatus is more cost-effective than universal vaccination. However, if seroprevalence is less than 45%, universal vaccination without screening is considered the best strategy. In this study, the overall seroprevalence of anti-HAV (total) was greater than 45% (51.06%). Although universal vaccination against HAV is not available in Korea, the epidemiologic shift of HAV indicates that Korea—and countries with similar issues—should promote childhood vaccination and consider catch-up vaccination for adolescents and young adults, including high-risk populations such as military personnel and individuals with chronic liver disease. This study has identified the age and regional groups at high risk.

In conclusion, we described the recent epidemiologic characteristics of HAV in Korea. We recommend prompt scheduling of both childhood vaccinations and catch-up vaccinations for adolescents and young adults, including high-risk populations. This is the largest nationwide study by 1 laboratory in Korea, and it provides useful baseline data on recent hepatitis A infection in Asia.

ACKNOWLEDGMENTS

This work was supported by a grant from Inje University. Conflicts of interest: None declared.

REFERENCES

1. Cutbertt JA. Hepatitis A: old and new. Clin Microbiol Rev. 2001;14:38–58.

2. Brundage SC, Fitzpatrick AN. Hepatitis A. Am Fam Physician. 2006;73:2162–8.

3. Atkinson W. Hepatitis A. Epidemiology and prevention of vaccine-preventable diseases. 8th ed. Atlanta, Ga.: Centers for Disease Control and Prevention; 2005. p. 177–89, A11, A33–4.

4. World Health Organization. Hepatitis A vaccine: WHO position paper. Accessed February 22, 2013, at: http://www.who.int/docstore/wer/pdf/2000/wer7505.pdf.

5. Prevention of hepatitis A through active or passive immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep. 1999;48:1–37.

6. Moon HW, Cho JH, Hur M, Yun YM, Choe WH, Kwon SY, et al. Laboratory characteristics of recent hepatitis A in Korea: Ongoing epidemiological shift. World J Gastroenterol. 2010;16:1115–8.

7. Barzaga BN. Hepatitis A shifting epidemiology in South-East Asia and China. Vaccine. 2000;18 Suppl 1:S61–4.

8. Song HJ, Kim TH, Song JH, Oh HJ, Ryu KH, Yeom HJ, et al. Emerging need for vaccination against hepatitis A virus in patients with chronic liver disease in Korea. J Korean Med Sci. 2007;22:218–22.

9. Lee D, Cho YA, Park Y, Hwang JH, Kim JW, Kim NY, et al. Hepatitis a in Korea: epidemiological shift and call for vaccine strategy. Intervirology. 2008;51:70–4.

10. Lee A, Lim HS, Nam CM, Song SM, Yoon HR, Lee KR. An epidemiological analysis of hepatitis A virus serologic markers during the recent four years in Korea. Korean J Lab Med. 2009;29:563–9.

11. Choi HJ, Lee SY, Ma SH, Kim JH, Hur JK, Kang JH. Age related prevalence of antibodies to hepatitis A virus performed in Korea in 2005. Korean J Pediatr Infect Dis. 2005;12:186–94.

12. Kim TY, Sohn JH, Ahn SB, Son BK, Lee HL, Eun CS, et al. Comparison of recent IgG anti-HAV prevalence between two hospitals in Seoul and Gyeonggi area. Korean J Hepatol. 2007;13:363–9.

13. Kang HM, Jeong SH, Kim JW, Lee D, Choi CK, Park YS, et al. Recent etiology and clinical features of acute viral hepatitis in a single center of Korea. Korean J Hepatol. 2007;13:495–502.

14. Kim DK, Kim YD, Jang HO, Jo JR. Prevalence of hepatitis A IgG antibody in children and adolescents in Gyeonggi Province. Inje Med J. 2006;27:53–8.

15. Kim H, Kim JH, Kim DU, Hur JK, Lee WB, Seo BK, et al. Epidemiological changes and clinical features of hepatitis A in children, living in Kyung-gi province, since 1988 to 1998. Korean J Pediatr Infect Dis. 1998;5:230–8.

16. Kwon SY. Current status of liver diseases in Korea: Hepatitis A. Korean J Hepatol. 2009;15 Suppl 6:87–12.

17. Kang CI, Choi CM, Park TS, Lee DJ, Oh MD, Choe KW.
Incidence and seroprevalence of hepatitis A virus infections among young Korean soldiers. J Korean Med Sci. 2007;22:546–8.

18. Lee CS, Lee JH, Kwon KS. Outbreak of hepatitis A in Korean military personnel. Jpn J Infect Dis. 2008;61:239–41.

19. Shin DH, Han SK, Choi PC, Lim SW, Kim KM, Sinn DH. Vaccination rate and seroepidemiology of hepatitis a in chronic-hepatitis-B-infected individuals in the korean army. Gut Liver. 2010;4:207–11.

20. Lee CS, Kwon KS, Koh DH, Youm JH, Gwack J, Lee JH. Declining hepatitis A antibody seroprevalence in the Korean military personnel. Jpn J Infect Dis. 2010;63:192–4.

21. Kim JH, Kang JH, Seo K, Kim HM, Choi JY. A survey for seroprevalence of antibody to hepatitis A and development of policy. Seoul: Korea Centers for Disease Control and Prevention; 2006. p. 1–41.

22. Jung YK, Kim JH. Epidemiology and clinical features of acute hepatitis A: from the domestic perspective. Korean J Hepatol. 2009;15:438–45.

23. Kim DH, Park KJ, Kim SH, Cho SB, Lee WS, Park CH, et al. Clinical characteristics of patients with acute hepatitis A in Gwangju-Chonnam province for recent 10 years. Korean J Med. 2007;72:131–7.

24. Song MH, Lim YS, Song TJ, Choi JM, Kim JI, Jun JB, et al. The etiology of acute viral hepatitis for the last 3 years. Korean J Med. 2005;68:256–60.

25. Rajan E, Shattock AG, Fielding JF. Cost-effective analysis of hepatitis A prevention in Ireland. Am J Gastroenterol. 2000;95:223–6.