



Seroprevalence of Hepatitis A Virus among Healthy Individuals in Birjand, Eastern Region of Iran

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Abstract

Background: Hepatitis A virus (HAV) is an epidemiological important infectious agent in the world. HAV incidence can be controlled by cognizance of the geographic distribution pattern.

Objectives: The aim of this study was to evaluate the frequency of HAV infection in Birjand.

Methods: A total of 496 healthy individuals (mean age: 39.34 ± 15.47 , range: 15 - 70 years, M/F ratio: 0.68) were randomly enrolled in this cross-sectional study. Demographic data were collected and the presence of anti-HAV total antibody was determined by the enzyme linked immunosorbent assay (ELISA).

Results: Overall, the prevalence of positive serum anti-HAV antibody was 92.78%, however, the rate for 15 - 24 years subjects was 69%. There was a significant positive correlation between presence of anti-HAV antibody with age ($P < 0.001$), marriage ($P < 0.001$), education ($P = 0.001$) and anti-Hbc antibodies ($P = 0.007$).

Conclusions: The result of this study showed a high prevalence of HAV antibody in most people, except for young adults, which can be an alarming sign for a higher rate of complicated HAV infections in the future and needs a proper strategy.

Keywords: Birjand, Hepatitis A, Seroprevalence

1. Background

Hepatitis A virus (HAV), a member of the Picornaviridae family (1), is an epidemiological important virus with a worldwide distribution and high incidence in low-income countries (2). HAV can be transmitted via different pathways, such as fecal-oral route and contaminated food and water (3). HAV infection, during childhood, is mostly an asymptomatic benign disease, however, the disease severity rises with age (4).

2. Objectives

Several studies have been performed regarding the epidemiology different types of hepatitis viruses in our region (5, 6), however, there is no data regarding the prevalence of HAV infection yet, therefore the objective of this study was to evaluate the seroprevalence of HAV antibody, among a sample population of Birjand city, Iran.

3. Methods

In this cross-sectional study, 496 individuals were randomly selected from a previous cohort conducted on Birjand inhabitants, age between 15 - 70 years (6). Non-Iranians and individuals with cognitive problems were excluded from this study. The project was approved by the university ethics committee and all participants handed a written informed consent.

Participants completed a designed questionnaire and subdivided into five groups with equal case numbers.

Presence of serum total antibodies against Hepatitis A, C, D viruses and hepatitis B core antigen as well as hepatitis B surface antigen were identified by commercial ELISA kits (DIAPRO, Diagnostic Bioprobes, Milano, Italy) using 100 μ L of serum.

Chi-square (χ^2) test was used for data analysis, using SPSS Version 16 and P values < 0.05 considered statistically significant.

Table 1. Correlation of HAV Seropositivity with Subject's Characteristics

| Variable | Total (n = 496) | HAV, No. (%) | | P |
|-----------------------------|-----------------|--------------------|-------------------|---------|
| | | Positive (n = 460) | Negative (n = 36) | |
| Gender | | | | |
| Male | 294 (59.3) | 274 (59.6) | 20 (55.6) | 0.725 |
| Female | 202 (40.7) | 186 (40.4) | 16 (44.4) | |
| Marriage status | | | | |
| Unmarried | 106 (21.4) | 78 (17) | 28 (77.8) | < 0.001 |
| Married | 378 (76.2) | 370 (80.4) | 8 (22.2) | |
| Widow | 12 (2.4) | 12 (2.6) | 0 | |
| Educational level | | | | |
| Illiterate | 56 (11.3) | 56 (12.2) | 0 | 0.001 |
| Elementary | 103 (20.8) | 103 (22.4) | 0 | |
| Intermediate | 62 (12.5) | 56 (12.2) | 6 (16.7) | |
| High school diploma | 156 (31.5) | 138 (30) | 18 (50) | |
| University level | 119 (24) | 107 (23.3) | 12 (33.3) | |
| Alcohol consumption | | | | |
| Yes | 3 (0.6) | 2 (0.4) | 1 (2.8) | 0.207 |
| No | 483 (99.4) | 448 (99.6) | 35 (97.2) | |
| Hepatitis history | | | | |
| Yes | 8 (1.6) | 7 (1.5) | 1 (2.8) | 0.461 |
| No | 480 (98.4) | 445 (98.5) | 35 (97.2) | |
| Jaundice history | | | | |
| Yes | 16 (3.5) | 15 (3.6) | 1 (2.9) | > 0.999 |
| No | 438 (96.5) | 404 (96.4) | 34 (97.1) | |
| Acupuncture history | | | | |
| Yes | 8 (1.7) | 7 (1.6) | 1 (2.8) | 0.469 |
| No | 469 (93.8) | 434 (98.4) | 35 (97.2) | |
| Imprisonment history | | | | |
| Yes | 5 (1) | 5 (1.1) | 0 | > 0.999 |
| No | 475 (99) | 439 (98.9) | 36 (100) | |

4. Results

Among different demographic factors, marriage and lower level of education had significant correlation with HAV seroprevalence. Table 1 demonstrates the correlation with different demographic characteristics. The overall prevalence of anti-HAV antibody was 92.78%, however, it dramatically decreased to 69% in the youngest group. Table 2 shows seroprevalence of different hepatitis in different age groups.

5. Discussion

This study was performed to evaluate the seroprevalence of hepatitis A in a broad age range. A high rate of anti-HAV antibody was found in all age groups, except young people.

Similar to our findings, seroprevalence of HAV in 17 - 27 years old subjects of Isfahan was 67.5% (7). Another study also reported almost 100% of HAV seropositivity among elderly patients (50 - 70 years) (8).

Previous studies have confirmed the regional variation in HAV distribution. A meta-analysis that was performed 2014 in Iran reported 51% of HAV endemicity (9). While in recent systematic review HAV endemicity was reported about 62% (10).

These variations in prevalence and discrepancies in epidemiological patterns of HAV seroprevalence may be caused by differences in selection methods, the size of the study, hygienic status and socioeconomic condition of study population (9).

Studies that performed in different areas of the world (4, 11) and Iran have shown a clear higher incidence of HAV, among adults and elderly and a decrease rate of exposure

Table 2. Seroprevalence of Different Hepatitis and HBsAg in Different Age Groups

| Age Groups, y | Male (n = 202) | Female (n = 294) | Anti-HAV, % | Anti-HCV, % | Anti-HDV, % | Anti-Hbc, % | HBsAg, % |
|---------------|----------------|------------------|-------------|-------------|-------------|-------------|----------|
| 15 - 24 | 48 | 52 | 69 | 2 | 0 | 0 | 0 |
| 25 - 34 | 37 | 63 | 96 | 0 | 0 | 5.1 | 2 |
| 35 - 44 | 41 | 58 | 98.9 | 0 | 0 | 10.1 | 2 |
| 45 - 54 | 35 | 63 | 100 | 0 | 0 | 17.3 | 1 |
| 55 - 70 | 41 | 58 | 100 | 1 | 0 | 24.5 | 3 |

at younger ages, due to improvement of socioeconomic status and health standards in recent decades. In this regard, in the future we may see more severe cases of HAV infection in older adults due to higher susceptibility (12).

In our study, age was significantly correlated with the higher prevalence of anti-HAV antibodies in all groups, supported by previous epidemiological reports (12). This finding can be explained by poor hygiene and lack of clean water resources and sanitation in the past decays.

In line with previous studies, seroprevalence of anti-HAV was less in unmarried individuals than in married patients (2). However, like some studies (1), seroprevalence of anti-HAV antibody was not correlated with sex in our cohort.

In contrast to our finding and study performed in Poland (13), some studies indicated that, education level had no effect on the HAV prevalence (14).

Several reports have shown that people who are infected with more than one hepatitis virus tend to experience more severe disease (15). In this study there was no correlation between HAV and other viral hepatitis, except Hbc antibody. This is consistent with the study of Cho et al. (8), concluding that infection with HBV or HCV did not change the immune response. As the prevalence of Hbc-antibody follows the similar pattern of HAV-antibody and decreases dramatically in younger people, the correlation between HAV and Hbc seroprevalence can be explained by personal health and environmental issues, which has been poor among older people. In general, hepatitis B and C have different transmission routes, usually occur in older age than HAV, and can cause chronic infections while hepatitis A, especially in children, is a self-limited infection and therefore, lack of association between HAV and either HBV or HCV is reasonable.

5.1. Conclusion

The results of this study showed a high rate of HAV seroprevalence in adults and elders, and a dramatic decrease in young adults, which can be an alarming sign. To prohibit the negative consequences and reduce the burden of future outbreaks, proper strategies for prevention and disease control should be applied.

References

- Hosseini Shokouh SJ, Dadashi A, Abiri M, Zohrevand I, Eshraghian A, Khoshdel A, et al. HAV Immunity in Iranian Medical Students. *Hepat Mon.* 2015;15(3). e26219. doi: 10.5812/hepatmon.26219. [PubMed: 25825590]. [PubMed Central: PMC4359362].
- Ahmadi Vasmehjani A, Javeshghani D, Baharlou R, Shayestehpour M, Mousavinasab SD, Joharinia N, et al. Hepatitis A infection in patients with chronic viral liver disease: a cross-sectional study in Jahrom, Iran. *Epidemiol Infect.* 2015;143(3):534-9. doi: 10.1017/S0950268814000806. [PubMed: 24742346].
- Chung SJ, Kim TY, Kim SM, Roh M, Yu MY, Lee JH, et al. Changes in the seroprevalence of IgG anti-hepatitis A virus between 2001 and 2013: experience at a single center in Korea. *Clin Mol Hepatol.* 2014;20(2):162-7. doi: 10.3350/cmh.2014.20.2.162. [PubMed: 25032182]. [PubMed Central: PMC4099331].
- Carrillo-Santistevan P, Tavoschi L, Severi E, Bonfigli S, Edelstein M, Bystrom E, et al. Seroprevalence and susceptibility to hepatitis A in the European Union and European Economic Area: a systematic review. *Lancet Infect Dis.* 2017;17(10):e306-19. doi: 10.1016/S1473-3099(17)30392-4. [PubMed: 28645862].
- Ebrahimzadeh A, Azarkar Z, Ziaee M, Sharifzadeh G, Bijari B. Prevalence and Risk Factors of Hepatitis C Infection (HCV) in Birjand, Iran, 2014. *INT J Infection.* 2016;3(1). doi: 10.17795/iji-34102.
- Ziaee M, Ebrahimzadeh A, Azarkar Z, Namaei MH, Saburi A, Fereidouni M, et al. Seroprevalence and Risk Factors for Hepatitis B in an Adult Population: The First Report from Birjand, South Khorasan, Iran. *Hepat Mon.* 2016;16(9). e36452. doi: 10.5812/hepatmon.36452. [PubMed: 27822260]. [PubMed Central: PMC5090805].
- Vakili B, Rahimi H, Ataei B, Janghorbani M, Khorvash F, Shoaie P, et al. Hepatitis A seropositivity among newly admitted medical students of Isfahan, Kermanshah, and Hamedan: A seroprevalence study. *J Res Med Sci.* 2014;19(Suppl 1):S9-S12. [PubMed: 25002901]. [PubMed Central: PMC4078374].
- Cho HC, Paik SW, Kim YJ, Choi MS, Lee JH, Koh KC, et al. Seroprevalence of anti-HAV among patients with chronic viral liver disease. *World J Gastroenterol.* 2011;17(2):236-41. doi: 10.3748/wjg.v17.i2.236. [PubMed: 21245998]. [PubMed Central: PMC3020379].
- Farajzadegan Z, Hoseini SG, Kelishadi R, Jamshidi F, Nokhodian Z, Noori R, et al. Systematic review and meta-analysis on the age-specific seroprevalence of hepatitis A in Iran. *J Res Med Sci.* 2014;19(Suppl 1):S56-63. [PubMed: 25002897]. [PubMed Central: PMC4078371].
- Safiabadi M, Rezaee-Zavareh MS, Alavian SM. Estimation of Hepatitis A Virus Infection Prevalence Among Eastern Mediterranean and Middle Eastern Countries: A Systematic Review and Pooled Analysis. *Hepat Mon.* 2017;17(2). doi: 10.5812/hepatmon.44695.
- Klevens RM, Denniston MM, Jiles-Chapman RB, Murphy TV. Decreasing immunity to hepatitis A virus infection among US adults: Findings from the National Health and Nutrition Examination Survey (NHANES), 1999-2012. *Vaccine.* 2015;33(46):6192-8. doi: 10.1016/j.vaccine.2015.10.009. [PubMed: 26476364].

12. Asaei S, Ziyaeyan M, Moeini M, Jamalidoust M, Behzadi MA. Seroprevalence of Hepatitis A and E Virus Infections Among Healthy Population in Shiraz, Southern Iran. *Jundishapur J Microbiol.* 2015;**8**(7):e19311. doi: [10.5812/jjm.19311v2](https://doi.org/10.5812/jjm.19311v2). [PubMed: [26421130](https://pubmed.ncbi.nlm.nih.gov/26421130/)]. [PubMed Central: [PMC4584134](https://pubmed.ncbi.nlm.nih.gov/PMC4584134/)].
13. Bura M, Bura A, Adamek A, Michalak M, Marszalek A, Hryckiewicz K, et al. Seroprevalence of hepatitis A virus antibodies (anti-HAV) in adult inhabitants of Wielkopolska region, Poland—the role of simple demographic factors. *Ann Agric Environ Med.* 2012;**19**(4):738–41. [PubMed: [23311799](https://pubmed.ncbi.nlm.nih.gov/23311799/)].
14. Ataei B, Javadi AA, Nokhodian Z, Kassaieian N, Shoaie P, Farajzadegan Z, et al. HAV in Isfahan province: a population-based study. *Trop Gastroenterology.* 2010;**29**(3):160–2.
15. Koff RS. Risks associated with hepatitis A and hepatitis B in patients with hepatitis C. *J Clin Gastroenterol.* 2001;**33**(1):20–6. [PubMed: [11418785](https://pubmed.ncbi.nlm.nih.gov/11418785/)].