



Increase in Adult Acute Hepatitis A Cases Following the Earthquake: An Epidemiological and Clinical Evaluation

Deprem Sonrası Erişkin Akut Hepatit A Olgularında Artış: Epidemiyolojik ve Klinik Değerlendirme

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ABSTRACT

Objectives: Acute hepatitis A continues to be an important public health problem in developing countries. This study aimed to evaluate the epidemiological, clinical, and laboratory characteristics of adult cases of acute hepatitis A observed in Adana and surrounding areas over the last five years, and to highlight the increase in cases after the 2023 earthquakes. Examine the potential association between the post-disaster period and the observed trend in case numbers.

Materials and Methods: This retrospective cross-sectional study included adult patients diagnosed with acute hepatitis A between January 2020 and May 2025. The patients' demographic data, clinical findings, laboratory results, and the development of complications were examined.

Results: The median age of the 31 adults with acute hepatitis A included in the study was 23 years (range 18-51), and 64.5% cases were male. The most common presenting complaints were nausea-vomiting (83.9%), abdominal pain (64.5%), and dark urine (58.1%). The mean alanine transaminase level was 2205 ± 1223 U/L, while the median aspartate aminotransferase level was 1102 U/L. Although the highest frequency of cases occurred during the winter (54.8%), a notable clustering in case numbers was observed in 2023 and 2024, temporally coinciding with the period following the February 6 earthquakes. Risk factors included living in crowded environments (25.8%) and being military personnel (12.9%), alongside documented instances of intra-familial transmission.

Conclusion: The vast majority of acute hepatitis A cases occurred in young adults, and a marked increase in case numbers was observed, particularly in the post-earthquake period. These findings suggest that hepatitis A remains an important public health problem and that environmental factors may affect the epidemiology of hepatitis A. The increase in cases may be associated with post-earthquake living conditions, inadequate

ÖZ

Amaç: Akut hepatit A, gelişmekte olan ülkelerde hala önemli bir halk sağlığı sorunu olmaya devam etmektedir. Bu çalışmanın amacı, Adana ve çevresinde son beş yılda izlenen erişkin akut hepatit A olgularının epidemiyolojik, klinik ve laboratuvar özelliklerini değerlendirmek ve 2023 yılında meydana gelen depremler sonrasında gözlenen olgu artışına dikkat çekmektir. Afet sonrası dönem ile olgu sayılarındaki gözlemlenen eğilim arasındaki olası ilişkiyi incelemektir.

Gereç ve Yöntemler: Bu retrospektif kesitsel çalışma, Ocak 2020-Mayıs 2025 tarihleri arasında görülen akut hepatit A tanısı almış erişkin hastaların verileri kullanılarak gerçekleştirilmiştir. Hastaların demografik verileri, klinik bulguları, laboratuvar sonuçları ve komplikasyon gelişimi incelenmiştir.

Bulgular: Çalışmaya dahil edilen 31 erişkin akut hepatit A olgusunun medyan yaşı 23 (18-51) yıl idi ve olguların %64,5'i erkekti. En sık başvuru yakınmaları bulantı-kusma (%83,9), karın ağrısı (%64,5) ve idrar renginde koyulaşmaydı (%58,1). Ortalama alanin transaminaz düzeyi 2205 ± 1223 U/L, ortanca aspartat aminotransferaz 1102 U/L olarak saptanmıştır. Olgu sıklığının kış aylarında en yüksek oranda (%54,8) saptanmasına karşın; 2023 ve 2024 yıllarında, zamansal olarak 6 Şubat depremlerinin sonrasındaki dönemde örtüşen, olgu sayılarında belirgin bir kümelenme gözlenmiştir. Risk faktörleri incelendiğinde; olguların %25,8'inde kalabalık yaşam koşulları ve %12,9'unda askeri personel olma durumu dikkat çekerken, aile içi bulaş olguları da tespit edilmiştir.

Sonuç: Çalışma, akut hepatit A olgularının büyük çoğunluğunun genç erişkinlerde görüldüğünü ve özellikle deprem sonrası dönemde olgu sayılarında belirgin bir artış yaşandığını saptamıştır. Bu bulgular, hepatit A'nın hala önemli bir halk sağlığı sorunu olmaya devam ettiğini ve çevresel faktörlerin hastalığın epidemiyolojisi üzerinde etkiye sahip olabileceğini düşündürmektedir. Olgu artışının deprem sonrası yaşam koşulları, hijyen yetersizliği ve nüfus hareketleriyle ilişkili olabileceği düşünülmektedir. Bu

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hygiene, and population movements. Therefore, strengthening sanitation and effectively maintaining vaccination in high-risk groups post-disaster are of great importance.

Keywords: Hepatitis A, earthquake, viral hepatitis

Introduction

Hepatitis A virus (HAV) is a 27-32 nm, non-enveloped RNA virus with icosahedral symmetry belonging to the genus *Hepatovirus* of the *Picornaviridae* family (1). Transmission of the disease occurs through contaminated water or food, inadequate sanitation, poor personal hygiene, and oral-anal sex (2). In its latest report, the Centers for Disease Control and Prevention stated that the number of HAV cases in 2023 increased 1.2-fold compared to 2015 (3). In our country, the incidence of HAV infection was determined as 0.6 (per one hundred thousand) in 2024, while the incidence in the Southeastern Anatolia and Eastern Anatolia regions was found to be higher compared to other regions (4).

The clinical spectrum of HAV infection ranges from asymptomatic infection to fulminant hepatitis. Clinical manifestations vary depending on the host's age. While fewer than 30% of young children are symptomatic, approximately 80% of adults exhibit severe hepatitis symptoms (5).

Over the last five years, two major developments have significantly influenced the dynamics of infectious diseases in our region. The coronavirus disease-2019 (COVID-19) pandemic, which emerged in early 2020, initially led to a temporary decline in the incidence of infections transmitted via the fecal-oral route due to intensified hygiene practices, social distancing, and lockdown measures.

Subsequently, the devastating earthquakes on February 6, 2023, severely disrupted public health stability in southern Türkiye. Extensive damage to sewage and clean water networks, combined with communal living in temporary shelters such as container cities and tents, posed a significant risk of transmission of water- and foodborne pathogens such as HAV.

Our aim in this study is to retrospectively evaluate adult cases of acute HAV diagnosed in our clinic between 2020 and the first five months of 2025 and to comprehensively assess the epidemiological distribution, clinical course, laboratory findings, development of complications, and risk factors of the disease.

It is anticipated that our study will provide insight into infectious disease dynamics in the post-disaster period and contribute to both regional public health policies and epidemiological surveillance strategies.

Materials and Methods

This retrospective cross-sectional study was conducted using data from adult patients diagnosed with acute HAV in a tertiary healthcare institution in Adana, Türkiye between January 2020 and May 2025. The study included adult patients (aged ≥ 18 years) diagnosed with acute HAV based on anti-HAV immunoglobulin M

nedenle, afet sonrası dönemlerde sanitasyonun güçlendirilmesi ve riskli gruplarda aşılamanın etkin biçimde sürdürülmesi önem arz etmektedir.

Anahtar Kelimeler: Hepatit A, deprem, viral hepatit

(IgM) positivity and consistent clinical findings. Individuals under 18 years of age, patients with incomplete clinical records, and cases of viral hepatitis other than acute HAV were excluded.

All patients' sociodemographic data at admission, laboratory parameters, complications developing during follow-up, and liver ultrasonography findings were recorded. The distribution of cases by year was examined. Data were obtained from the hospital information management system and personal data were anonymized for analysis.

While the diagnosis was primarily based on anti-HAV IgM positivity accompanied by clinical findings, anti-HAV IgG levels and antibody titer changes were not recorded during the follow-up period.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (Armonk, NY: IBM Corp.). Descriptive statistics were expressed as numbers and percentages for categorical variables. For continuous variables, data were presented as medians and ranges (minimum-maximum) or means $\pm$ standard deviations, depending on the normality of the distribution.

Ethics

Ethical approval for this study was obtained from the University of Health Sciences Türkiye, Adana City Training and Research Hospital Clinical Scientific Ethics Committee (decision no: 588, date: 10 July 2025). The study was conducted in accordance with the ethical principles of the 1964 Declaration of Helsinki and its later amendments.

Results

The median age of the 31 adult cases of acute HAV included in the study was 23 years (18-51). Among the patients, 64.5% (n=20) were male and 35.5% (n=11) were female.

When the distribution of cases by year was examined, no cases were detected in 2020; four (12.9%) cases were detected in 2021; two (6.45%) cases were detected in 2022; 11 (35.4%) cases were detected in 2023; 13 (41.9%) cases were detected in 2024; and one (3.2%) case of HAV infection was detected in the first five months of 2025 (Figure 1). Regarding the seasonal distribution, the highest number of cases was observed in winter (n=17, 54.8%). Six (19.35%) cases were detected in autumn, four (12.90%) cases in spring, and four (12.90%) cases in summer. January (n=8, 25.8%), December (n=7, 22.5%), and October (n=3, 9.6%) were the months with the highest number of cases.

In our study, the distribution of cases by place of residence showed that 18 cases were reported from districts of Adana province,

five from Hatay, two from Mersin, and two from Osmaniye. In addition, four cases were detected among individuals on military duty in Syria. Figure 2 shows the distribution of cases by residence: intra-provincial (within the province) and extra-provincial (outside the province).

The median time from symptom onset to admission was 5 days (range, 2-12), and the median length of hospital stay was 5 days (range, 1-12). When exposure histories were evaluated, eight cases (25.8%) had crowded living conditions, three (9.7%) had a history of travel, one (3.2%) had rural living conditions, and one (3.2%) had a history of close household contact. Two patients (6.4%) had a history of using tap water.

When presenting complaints were examined, the most frequently reported symptoms were nausea and vomiting ($n=26$, 83.9%), abdominal pain ($n=20$, 64.5%), and darkening of urine color ($n=18$, 58.1%). These were followed by fatigue ($n=17$, 54.8%), fever ($n=8$, 25.8%), myalgia ($n=6$, 19.4%), pale stools ($n=4$, 12.9%), and pruritus ($n=1$, 3.2%). Among the patients evaluated by abdominal ultrasonography, gallbladder wall thickening and pericholecystic edema were each observed in 8 (25.8%) cases.

When the patients' laboratory data were evaluated, the median aspartate aminotransferase was 1102 U/L, the mean alanine

transaminase (ALT) was 2205 ± 1223 U/L, the median total bilirubin was 6.3 mg/dL, the median direct bilirubin was 4.04 mg/dL, the mean prothrombin time was 16.5 ± 3.4 seconds, and the median international normalized ratio was 1.39. Other laboratory findings are shown in Table 1. Additionally, bilirubinuria was detected in seven (22.6%) patients, and urobilinogenuria was detected in one (3.2%) patient. Chronic HBV coinfection was detected in one case, while anti-hepatitis C virus and anti-human immunodeficiency virus tests were negative in all patients.

Hematological complications were detected in four cases (12.9%), including leukopenia in one case (3.2%) and thrombocytopenia in three cases (9.6%). None of the patients developed a relapse or fulminant hepatitis. Only one patient (3.2%) was followed as an outpatient, while 30 patients (96.8%) were hospitalized and monitored in our clinic. None of our cases were fatal.

Discussion

HAV is one of the leading causes of acute hepatitis worldwide. When the global distribution is examined, the incidence and seroprevalence vary greatly between countries (6). Highly endemic regions such as South Asia and sub-Saharan Africa are characterized by poor hygiene conditions, while low-endemic regions are countries with high socioeconomic levels (7). In their multicenter study, Tosun et al. (8) reported that HAV seropositivity increased significantly with age; HAV seronegativity was detected in one-fourth of individuals younger than 26 years and in one-fifth of the 27-33 age group, whereas in individuals aged 40 years and older, seronegativity decreased significantly to 5% and below.

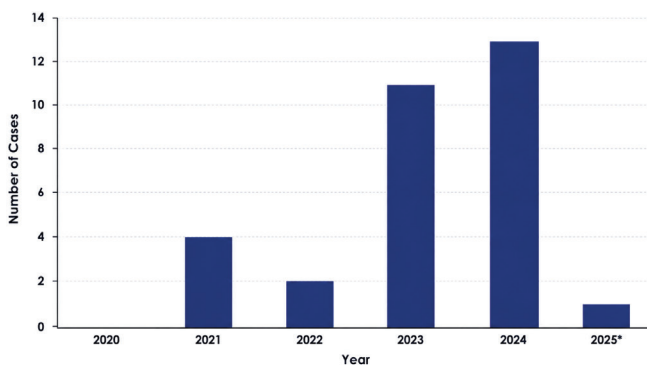


Figure 1. Number of acute hepatitis A cases by year (* the first five months)

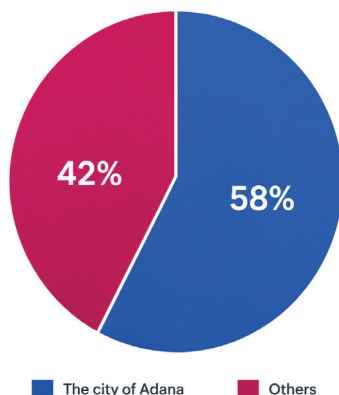


Figure 2. Distribution of cases

Table 1. Baseline laboratory findings in adult patients with acute hepatitis A

Parameter	Mean $\pm$ SD/median (min-max)
WBC (cells/mm ³)*	6327.8 $\pm$ 1597.4
Hemoglobin (g/dL)**	14.1 (6.1-18)
Hematocrit (%)*	41.7 $\pm$ 6.3
Platelet (/mm ³)**	205000 (113000-434000)
AST (U/L)**	1102 (74-3743)
ALT (U/L)*	2205 $\pm$ 1223
ALP (U/L)**	151 (89-309)
GGT (U/L)**	140.5 (73-565)
Total Bilirubin (mg/dL)**	6.3 (0.58-32)
Direct Bilirubin (mg/dL)**	4.04 (0.17-22.08)
PT (sec)*	16.5 $\pm$ 3.4
INR**	1.39 (0.9-2.36)
Albumin (g/L)*	38.7 $\pm$ 4.8
Creatinine (mg/dL)**	0.67 (0.37-1.41)

Variables indicated with * are mean $\pm$ SD; variables indicated with ** are median (min-max). SD: Standard deviation, WBC: White blood cell, AST: Aspartate aminotransferase, ALT: Alanine transaminase, ALP: Alkaline phosphatase, GGT: Gamma glutamyl transpeptidase, PT: Prothrombin time, INR: International normalized ratio

When the seasonal distribution reported in the literature is examined, a study conducted in Brazil showed that HAV infections were higher in spring and autumn, concluding that they increased during hot seasons with heavy rainfall (9). In a study from Türkiye, spring (38.1%) and winter (28.6%) were the seasons in which the highest number of cases were detected (10). In our study, contrary to the literature, the highest number of cases was observed in winter (54.8%).

This rate can be explained by the increased stability of HAV in cold, damp environments and by the inevitable close contact in overcrowded temporary shelters with inadequate ventilation following the earthquake. Furthermore, logistical challenges maintaining water chlorination and personal hygiene during cold weather may have weakened the fundamental barriers to fecal-oral transmission.

In our study, the highest numbers of cases were reported in 2023 (11 cases, 35.5%) and in 2024 (13 cases, 41.9%). The complete absence of cases in 2020 suggests that the stringent hygiene measures and lockdowns implemented during the COVID-19 pandemic effectively suppressed the fecal-oral transmission of HAV. However, this period of minimal circulation likely created an "immunity gap" by interrupting natural community exposure.

There was a significant increase in acute HAV cases in 2023 and 2024. This increase is thought to be closely related to changes in regional and personal living conditions. Data from the communicable diseases unit of the general directorate of public health indicate that 72 cases were observed in Adana province during the same period as our study. While 31 cases aged 18 years and older were seen only at our hospital, 28 such cases were reported to the system. This discrepancy indicates deficiencies in case reporting. When the distribution by year is examined, a total of 25 cases were observed in 2023 and 24 in 2024 among both children and adults. In the province of Adana, an increase in the number of cases was also observed, consistent with data from our center.

Following the major earthquakes that occurred on February 6, 2023, significant damage occurred in the infrastructure systems due to the displacement of fault lines (11). This made access to clean water difficult and created a food safety problem. Sewage systems and personal hygiene practices deteriorated. As a temporary post-disaster housing solution, container settlements were established, and the population was compelled to live in communal living areas with limited resources (12). Although temporary field hospitals were set up because of inadequate regional health infrastructure, our hospital received a high volume of patient transfers from neighboring provinces until fully equipped hospitals opened.

In a review conducted by Saatchi et al. (13), HAV infections were also reported among the most frequently observed infectious diseases following earthquakes. HAV and E showed higher prevalence rates immediately after the earthquakes that occurred in the city of Düzce in 1999 (14).

The incubation period of HAV ranges from 15 to 50 days and is reported to be an average of 28 days (3). This long incubation period

increases the potential for infected individuals to transmit the virus before becoming symptomatic, making infection control particularly challenging in communal living environments. As also indicated in our study, we had four military personnel who were serving in a military unit and were diagnosed as cases. Shared accommodation environments make the spread of HAV—transmitted via the fecal-oral route—inevitable. By 2025, the detection of only one adult case during the first five months of our study is thought to be related to improvements in environmental and personal conditions and a reduced need for referrals to our centrally located hospital.

The primary transmission route of the HAV is fecal-oral, and factors such as the consumption of contaminated water and food, close household contact, and crowded living environments play a significant role in transmission. The presentation of four acute HAV cases from the same family in Rize with complaints of jaundice and/or fatigue indicates that close household contact is an effective mode of transmission (15). In our study, two cases from the same family were diagnosed with acute HAV one month apart and subsequently monitored.

HAV outbreaks in Europe and the United States have been linked to sun-dried tomatoes imported from Türkiye (16) and pomegranate arils (17), respectively (18). In an outbreak reported in Milan with 353 cases, 172 cases were identified as "men who have sex with men" (19). Because HAV transmission is influenced by various environmental and behavioral factors, outbreaks emerge through multiple routes. In our study, the presence of four cases reported from a military unit is noteworthy, as it highlights the risk posed by crowded living conditions. Examples of outbreaks reported in different regions demonstrate the decisive role of these factors in the spread of HAV and emphasize the importance of implementing comprehensive public health measures to control the disease.

Chen et al. (20) reported that the most common presenting symptoms of acute HAV were dark urine (67.1%), nausea/vomiting (58.5%), fever (56%), and fatigue (55.6%). In our series, the most common presenting symptoms were nausea and vomiting, abdominal pain, and dark urine.

Study Limitations

Our study has several limitations, primarily its retrospective, single-center design and its relatively small sample size. Furthermore, the diagnosis was established solely on the basis of anti-HAV IgM positivity, in accordance with the inclusion criteria. The absence of anti-HAV IgG follow-up limits our ability to definitively exclude rare instances of false-positive IgM results. Nevertheless, the significantly elevated transaminase levels (mean ALT: 2205 U/L) and typical clinical presentation observed in 96.8% of our patients strongly support the accuracy of the acute HAV diagnosis. Therefore, the increase in reported cases in 2023 and 2024 should not be considered merely a random fluctuation but rather an indication of the impact of socioeconomic and environmental factors on infectious diseases. This underscores, once again, the importance, in post-disaster public health planning, of active surveillance, hygiene education, improvements in living conditions, and vaccination strategies aimed

at preventing infectious diseases such as HAV. Due to the absence of a control group and the lack of analysis of confounding factors such as migration and vaccination rates, these results should be interpreted as indicative of an association rather than a direct causal link.

Conclusion

Although the epidemiological pattern of HAV infection varies regionally, disrupted environmental conditions and inadequate hygiene in communal living areas following mass and regional disasters can significantly affect the epidemiological dynamics of infectious diseases. Our findings also highlight the necessity of integrating viral hepatitis surveillance into disaster preparedness and recovery plans.

Ethics

Ethics Committee Approval: Ethical approval for this study was obtained from the University of Health Sciences Türkiye, Adana City Training and Scientific Hospital Clinical Research Ethics Committee (decision no: 588, date: 10 July 2025).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Ö.T., T.T., T.A.G., Concept: Ö.T., T.T., T.A.G., Design: Ö.T., T.T., T.A.G., Data Collection or Processing: Ö.T., T.T., T.A.G., Analysis or Interpretation: Ö.T., T.T., T.A.G., Literature Search: Ö.T., T.T., T.A.G., Writing: Ö.T., T.T., T.A.G.

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