Research Article

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Hepatitis A Seroprevalence by Age Groups in Mardin Province

Mardin İlinde Yaş Gruplarına Göre Hepatit A Seroprevalansı

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ABSTRACT

Objective: Türkiye is a medium endemic country for hepatitis A virus (HAV) and the seroprevalence of HAV varies regionally. The aim of this study was to determine the immunity status against HAV according to age groups in Mardin province, where no seroprevalence study has been conducted.

Materials and Methods: Anti-HAV immunoglobulin G (IgG) tests which were requested from outpatient clinics of Mardin Training and Research Hospital between May 2024 and September 2024 were evaluated. Anti-HAV IgG was analysed with Cobas® 6000 system (Roche Diagnostics, Rotkreuz, Switzerland) by enzyme-linked immunosorbent assay method.

Results: Anti-HAV IgG results of 2765 patients were included in the study. The mean age of the patients was 34.72±19.27 years, 1459 were female (52.8%) and 1306 were male (47.2%). Anti-HAV IgG positivity was detected in 94.6% of the patients. This rate was 95.3% in males and 94.0% in females. The lowest rate of anti-HAV IgG positivity was in the age group of 13-18 years (66.7%). At the age of 50 years and older, anti-HAV IgG positivity was 100%. The mean age of seropositive patients was higher than seronegative patients (35.6 vs. 19.8, p<0.001). The seropositivity rate was found to be higher in children born after 2012 (when routine HAV vaccination began in childhood) than in children aged 13-18 born before 2012 (95.3% vs. 66.7%, p<0.001).

Conclusion: HAV seroprevalence was found to be high in Mardin province. Furthermore, the HAV vaccination programme has yielded positive results. As the 13-18 age group did not benefit from the programme, they are the most susceptible to HAV. Therefore, special vaccination programmes should be implemented for this age group.

Keywords: HAV seroprevalence, hepatitis A, vaccination

ÖZ

Amaç: Türkiye hepatit A virüsü (HAV) için orta endemik bir ülkedir ve HAV seroprevalansı bölgesel olarak değişmektedir. Bu çalışmanın amacı, daha önce seroprevalans çalışması yapılmamış olan Mardin ilinde yaş gruplarına göre HAV'ye karşı bağışıklık durumunu belirlemektir.

Gereç ve Yöntemler: Mayıs 2024 ve Eylül 2024 tarihleri arasında Mardin Eğitim ve Araştırma Hastanesi polikliniklerinden istenen anti-HAV immünoglobulin G (IgG) test sonuçları değerlendirilmiştir. Anti-HAV IgG, Cobas® 6000 sistemi (Roche Diagnostics, Rotkreuz, Switzerland) ile enzime bağlı immünosorbent assay yöntemi ile analiz edilmiştir.

Bulgular: Çalışmaya 2765 hastanın anti-HAV IgG sonuçları dahil edilmiştir. Hastaların yaş ortalaması 34,72±19,27 yıl, 1459'u kadın (%52,8) ve 1306'sı erkek (%47,2) idi. Hastaların %94,6'sında anti-HAV IgG pozitif saptanmıştır. Bu oran erkeklerde %95,3 iken kadınlarda ise %94,0 idi. Anti-HAV IgG pozitiflik oranı en düşük 13-18 yaş grubunda görülmüştür (%66,7). Elli yaş ve üzerinde anti-HAV IgG pozitifliği %100 bulunmuştur. Seropozitif hastaların yaş ortalamasının seronegatif hastalardan daha yüksek olduğu görülmüştür (35,6 vs. 19,8, p<0,001). Seropozitiflik oranı 2012 yılından sonra doğan çocuklarda (çocukluk çağında rutin HAV aşılamasının başladığı yıl) 2012'den önce doğan 13-18 yaş arası çocuklara göre daha yüksek bulunmuştur (%95,3'e karşı %66,7, p<0,001).

Sonuç: Mardin ilinde HAV seroprevalansı yüksek bulunmuştur. Bununla birlikte HAV aşılama programının olumlu sonuçları gözlemlenmiştir. HAV aşılama programından faydalanamamış olan 13-18 yaş grubu HAV'a karşı en duyarlı gruptur. Bu nedenle, bu yaş grubuna yönelik özel aşılama programları yapılmalıdır.

Anahtar Kelimeler: HAV seroprevalansı, hepatit A, aşılama

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Introduction

Hepatitis A virus (HAV) is a worldwide common viral infection transmitted by the fecal-oral route. The disease is usually self-limited, supportive care is usually sufficient for treatment and chronic infection does not occur (1). Clinical manifestations depend on the age of the patient. Less than 30% of infected young children are symptomatic, while approximately 80% of infected adults show severe hepatitis with markedly elevated serum aminotransferases. Fulminant hepatitis is rare, with a reported incidence of 0.015% to 0.5% (2). The first exposure to HAV occurs later in life in developed countries than in low-income countries (3). The majority of HAV infections in developing countries are not clinically apparent. In contrast, infections in developed countries are often characterised by jaundice and acute hepatitis, particularly in adolescents and adults (4). HAV is more prevalent in developing countries and low-income areas (5). The incidence of the disease depends mainly on socioeconomic status and access to clean water. In developing countries with poor sanitation, there is almost 100% seropositivity for anti-HAV immunoglobulin G (IgG) (6). In hyperendemic countries, the age at midpoint of population immunity (AMPI) can be as low as one year of age. Türkiye is a medium endemic country for HAV (7). However, the incidence of HAV varies regionally (8). In this study, we aimed to determine the seroprevalence of HAV in Mardin province, which had not been evaluated before.

Materials and Methods

Data Collection

In this cross-sectional prevalence study, the anti-HAV IgG test results of patients who applied to the outpatient clinics of Mardin Training and Research Hospital between May 2024 and September 2024 and who were requested for any reason were evaluated. The test results of the patients for whom the anti-HAV IgG was requested were recorded retrospectively. Patients were divided into 8 groups according to age: 0-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70 years and older.

Anti-HAV IgG tests were performed by enzyme-linked immunosorbent assay method using Cobas® 6000 system (Roche Diagnostics, Rotkreuz, Switzerland) in the microbiology laboratory. Anti-HAV IgG results below 1 signal cut-off (S/CO) were considered positive and anti-HAV IgG with >1 S/CO values were considered negative.

Statistical Analysis

The statistical analyses were conducted using SPSS version 27.0 (Statistical Package for the Social Sciences; IBM Corp., Armonk, NY, USA). Descriptive statistical methods, including mean, standard deviation, frequency, and ratio, were employed to evaluate the study data. A chi-square test was employed for the comparison of qualitative data. A Student's t-test was employed for the purpose of comparing variables that were normally distributed between two groups. In instances where the variables in question did not demonstrate a normal distribution, a Mann-Whitney U test was employed to facilitate comparison between the two groups. The level of statistical significance was set at $p<0.05$.

Ethics

The research was conducted in accordance with the principles of the Declaration of Helsinki. This study was ethically approved by the decision of Mardin Artuklu University Non-Interventional Clinical Research Ethics Committee dated 07.04.2025 and numbered 2025/3-8.

Results

The anti-HAV IgG results from the outpatient clinics of our hospital between the study dates were listed. Of the total 2999 tests, 85 repeated results and 149 tests that were not accepted by the laboratory were excluded from the study. Anti-HAV IgG results of 2765 patients were included in the study. The mean age of the patients was 34.72±19.27 years, 1459 were female (52.8%) and 1306 were male (47.2%). Anti-HAV IgG positivity was detected in 94.6% of all patients. This rate was 95.3% in males and 94.0% in females. There was no statistical difference between both genders in terms of anti-HAV IgG positivity ($p>0.05$). The lowest rate of anti-HAV IgG positivity was observed in the 10-19 age group (73.1%). All patients aged 50 years and older were found to be anti-HAV IgG positive. When anti-HAV IgG positivity rates were compared according to age groups, a statistically significant difference was found ($p<0.001$). Furthermore, the mean age of patients with anti-HAV IgG positivity was higher than that of patients with seronegativity (35.6 vs. 19.8, $p<0.001$). Seropositivity status according to age groups and gender is shown in Table 1.

In order to evaluate the effectiveness of the HAV vaccine, the pediatric patients were divided into two groups and the seropositivity rates were compared. The first group consisted of children aged 0-12 years who were born after 2012, when HAV vaccination was added to the vaccination schedule. The second group consisted of children aged 13-18 years. The seropositivity rate was 95.3% in those born after 2012 and 66.7% in those born before 2012 (odds ratio:10.1, 95% confidence interval: 5.35-19.23, $p<0.001$).

Discussion

In our study, a high rate of the anti-HAV IgG positivity (94.6%) was found in Mardin province. In 2011 and later studies in which all age groups were evaluated, anti-HAV IgG positivity rates were reported between 38.1% and 97.3% in different provinces of Türkiye (9,10,11,12,13,14,15). Nevertheless, the prevalence of HAV increases from west to east in Türkiye (8). In a study conducted on patients aged between 5-24 years in Istanbul, which contains many cultural elements in Türkiye, HAV seropositivity was found to be higher in people with low socioeconomic status. In the same study, anti-HAV IgG positivity was found to be higher in patients with low maternal education level (16). In the study conducted by Halicioglu et al. (17) in the pediatric age group in İzmir, seropositivity was found to be higher in those with a mother and father education period of 5 years or less, low income level and living in crowded families. Similar to the Southeastern Anatolia region in general, our province has a low socioeconomic level and overcrowded families. Rural life, difficulties in accessing clean water and inadequate sanitation may also be among the reasons for frequent prevalence of HAV in our province.

Table 1. The rates of anti-HAV IgG positivity according to age groups and gender

Age range and gender	Patient count	Anti-HAV IgG positivity		p-value
		n	%	
0-9 years	260	247	95.0	<0.001
10-19 years	242	177	73.1	
20-29 years	746	692	92.8	
30-39 years	589	575	97.6	
40-49 years	331	329	99.4	
50-59 years	216	216	100.0	
60-69 years	208	208	100.0	
70 years and above	173	173	100.0	
Female	1459	1390	95.3	0.124
Male	1306	1227	94.0	
Total	2765	2617	94.6	
0-12 years	297	283	95.3	<0.001
13-18 years	144	96	66.7	
0-18 years	441	379	85.9	
Anti-HAV IgG	Patient count	Mean age ± SD		p-value
Positive	2617	35.57±19.37		0.000
Negative	148	19.80±8.14		

HAV: Hepatitis A virus, IgG: Immunoglobulin G, SD: Standard deviation

Table 2. Evaluation of the effectiveness of hepatitis A vaccination based on studies assessing hepatitis A seroprevalence by age group

Author and publication year	Province and data dates	Age range	Patient count	Anti-HAV IgG positivity rate (%)	Interpretation of the effects of the hepatitis A vaccine
Our study	Mardin 2024	All ages	2765	94.6	Seropositivity was 95.3% in the 0-12 age group and 66.7% in the 13-18 age group (OR:10.1, 95% CI: 5.35-19.23, p<0.001).
					Children aged 0-12 who were born after the hepatitis A vaccination programme had higher rates of seropositivity compared to children born before the programme.
Samancı and Akdeniz (21) 2022	Diyarbakır 2009-2018	0 to 18 years	21267	53.8	Seropositivity was higher in those born after the vaccination programme than in those born before it (81.9% vs. 41.2%, p<0.001).
					The effect of the hepatitis A vaccine was examined directly, and it was found that seropositivity was significantly higher in the vaccinated group.
Atik et al. (10) 2021	Balıkesir 2017-2019	All ages	3450	68.6	Seropositivity was 63.1% in the 0-10 age group and 38.8% in the 11-17 age group.
					Although the effect of the hepatitis A vaccine has not been investigated directly, seropositivity was found to be higher in the 0-10 age group that had received partial vaccination than in the 11-17 age group that had not been vaccinated at all.

Table 2. Continued

Author and publication year	Province and data dates	Age range	Patient count	Anti-HAV IgG positivity rate (%)	Interpretation of the effects of the hepatitis A vaccine
Düzenli et al. (11) 2021	Çorum 2017-2020	All ages	10458	84.4	Seropositivity was 84.6% in the 0-10 age group and 71.6% in the 11-20 age group.
					The efficacy of the hepatitis A vaccine was not directly examined in this study, but it was shown that seropositivity was higher in partially vaccinated individuals aged 0-10 years than in unvaccinated individuals aged 11-20 years.
Yilmaz (12) 2020	Erzurum 2015-2018	All ages	25007	87.3	Seropositivity was 86.4% in the 0-4 age group, 73.2% in the 5-9 age group, 58.7% in the 10-14 age group and 75.2% in the 15-19 age group.
					This study did not directly examine the efficacy of the hepatitis A vaccine. However, it was found that seropositivity was higher in the 0-4 age group, most of whom were born after 2012, than in other childhood age groups.
Çalık et al. (19) 2019	İzmir 2015-2016	All ages	1336	74	Seropositivity was 87.5% in the 0-4 age group, 28% in the 5-9 age group, 20.8% in the 10-14 age group and 28.9% in the 15-19 age group.
					Also, this study did not directly examine the effectiveness of the hepatitis A vaccine. However, seropositivity was higher in the 0-4 age group, most of whom were born during the routine vaccination period, compared to other age groups in childhood.

HAV: Hepatitis A virus, IgG: Immunoglobulin G, OR: Odds ratio, CI: Confidence interval

In our province, the most susceptible group to HAV was found to be 13-18 age group. In addition, although HAV seropositivity is higher in older age groups, seropositivity is lower in the 10-19 age group compared to the 0-9 age group (95.0% vs. 73.1%). Similarly, in a study conducted in Balıkesir between 2017-2019, seropositivity was found to be 63.1% in the 0-10 age group and 38.8% in the 11-17 age group (10). In the study conducted by Atik et al. (10) in Çorum between 2017 and 2020, 84.6% of children aged 0-10 years had immunity against HAV, while this rate decreased to 71.6% between 11-20 years (11). In the studies conducted recently in Erzurum, Yozgat and İzmir, the lowest seropositivity was found in 10-14, 6-9 and 10-14 age groups, respectively (12,18,19). The most likely reason for this situation is the introduction of HAV vaccination into the routine vaccination schedule since 2012 (20). Seropositivity was generally lower in children born before 2012. In a study directly examining the effect of HAV vaccination, Samancı and Akdeniz (21) divided the anti-HAV IgG results of pediatric patients in Diyarbakır into two groups as before and after September 2012. While the anti-HAV IgG positivity rate between 2009-2012 was 41.2%, this rate increased to 81.9% between 2012-2018 ($p<0.001$) (21). In our study, the 95.3% seropositivity rate in the 0-12 age group, which includes children born after the routine vaccination period, can be considered as a success of childhood vaccination. Table 2 presents data from recent studies that evaluated HAV seroprevalence by age group in order to assess the effectiveness of the HAV vaccine. On the other hand, given the observed immunity gap among 10-19 years old, screening programmes should be implemented in high-risk environments such as schools, military bases and refugee camps to prevent potential HAV outbreaks in this age group. Other vulnerable population groups, such as migrants, people with limited access to clean water, and individuals planning to travel to endemic areas, should also be targeted. Especially for people in high-risk groups, catch-up vaccination strategies should be created. In addition, all children born before 2012 who visit a healthcare organisation for any reason should be screened for anti-HAV IgG.

The mean age of seropositive patients was found to be statistically higher than seronegative patients in our study. Similarly, in the study of Çeviker et al. (22), the mean age of seropositive and seronegative patients was found to be 37.5 and 23.0 years, respectively, and a statistically significant difference was found. In our study and in the majority of other studies, it has been shown that immunity against HAV is markedly increased at the age of 20 years and older (9,11,12,14,18). In the study conducted by Koroglu et al. (7) in 2015, the AMPI for HAV was found to be 17 years of age in Türkiye. While seropositivity rates ranged between 28% and 66.3% in different provinces in studies examining the childhood period (17,21,23,24,25,26); this rate was reported between 75% and 97.4% in studies covering only the adult age group (27,28,29,30,31).

In our study, no difference was found between both genders in terms of anti-HAV IgG seropositivity. In the studies of Şimşek Bozok and Bozok (9), Yilmaz (12) and Acikgoz et al. (32), seropositivity was found to be significantly higher in males than females. In contrast, seropositivity was found to be higher in women in the study by Çeviker et al. (22). However, no significant difference was found between genders in terms of anti-HAV IgG positivity in most studies (10,14,24,29,33).

Study Limitations

This study has several limitations. Firstly, it was conducted retrospectively using anti-HAV IgG test results from a single tertiary hospital, so it may not accurately represent the general population of Mardin province, particularly those without access to healthcare facilities. Secondly, important sociodemographic factors such as education level, household income, living conditions and access to clean water were not considered. Thirdly, due to the cross-sectional design of the study, it was not possible to assess causality.

Conclusion

A high community immunity rate against HAV was found in Mardin. In addition, the seropositivity rate of 95.3% in the 0-12 age group who received the HAV vaccine demonstrates the programme's effectiveness. However, special vaccination programmes need to be implemented for the 10-19 age group, particularly the 13-18 age group.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained from the Mardin Artuklu University Non-Interventional Clinical Research Ethics Committee (approval number: 2025/3-8, date: 07.04.2025).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Concept: M.S.T., D.İ., Design: M.S.T., Data Collection or Processing: M.S.T., D.İ., Analysis or Interpretation: M.S.T., Literature Search: M.S.T., D.İ., Writing: M.S.T., D.İ.

Conflict of Interest: No conflict of interest was declared by the authors.

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