



Comparison of Hepatitis B and Hepatitis C Seropositivity of the Syrian Immigrant and Turkish Local People

Suriyeli Göçmen ve Türk Yerel Halkın Hepatit B ve Hepatit C Seropozitifliğinin Karşılaştırılması

Sanem Karadağ Gencer

University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital, Clinic of Microbiology and Clinical Microbiology, Bursa, Turkey

ABSTRACT

Objectives: We compared the hepatitis B surface antigen (HBsAg), anti-HBs, anti-hepatitis C virus (anti-HCV) positivity of local Turkish and Syrian patients under temporary protection status according to age groups and gender and to evaluate the seroprevalence of hepatitis B virus (HBV) and HCV in our study.

Materials and Methods: HBsAg, anti-HBs and anti-HCV test results were compared of Syrian and Turkish patients who applied to University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital between January 2016 and December 2017 in our study.

Results: HBsAg positivity was higher in Turkish patients than Syrians in the 20-29 and 30-39 age groups. Anti-HBs positivity was higher in Turkish patients compared to Syrians in the 0-9 to 30-39 age groups. Anti-HCV positivity was higher in Syrian patients than Turks in 10-19 to 70-79 age groups. HBsAg, anti-HBs and anti-HCV positivity were higher in male patients than female patients in Syrian and Turkish patients.

Conclusion: It is necessary to develop national HBV vaccination policies, including young adults for Syrian immigrants, especially women in pregnancy age because they are risky for the transmission of hepatitis B infection and to conduct HBV and HCV infection screening and training for young adults who are risky in our country.

Keywords: Anti-HCV, anti-HBs, HBsAg, Syrian, Turkish

ÖZ

Amaç: Çalışmamızda, hastanemize başvuran yerel Türk hastaların ve geçici koruma statüsündeki Suriyeli hastaların hepatit B yüzey antijen (HBsAg), anti-HBs, anti-hepatit C virüs (anti-HCV) pozitifliklerini yaş grupları ve cinsiyete göre karşılaştırmayı ve hepatit B virüs (HBV) ve HCV seroprevalansını değerlendirmeyi amaçladık.

Gereç ve Yöntemler: Çalışmamızda Ocak 2016-Aralık 2017 tarihleri arasında Sağlık Bilimleri Üniversitesi, Bursa Yüksek İhtisas Eğitim ve Araştırma Hastanesi'ne başvuran Suriyeli ve Türk hastaların HBsAg, anti-HBs ve anti-HCV test sonuçları karşılaştırıldı.

Bulgular: HBsAg pozitifliği, 20-29 ve 30-39 yaş gruplarında Türk hastalarda, Suriyeli hastalardan anlamlı yüksek bulundu. Anti-HBs pozitifliği; 0-9, 10-19, 20-29, 30-39 yaş gruplarında Türk hastalarda Suriyeli hastalardan anlamlı yüksek belirlendi. Anti-HCV pozitifliği; 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 yaş gruplarında Suriyeli hastalarda, Türk hastalardan anlamlı yüksek saptandı. HBsAg, anti-HBs ve anti-HCV pozitifliği Suriyelilerde ve Türklerde erkeklerde kadınlardan istatistiksel olarak anlamlı yüksek bulundu.

Sonuç: Suriyeli göçmenlere yönelik genç erişkinleri özellikle hepatit B enfeksiyonunun bulaştırılması açısından riskli grup oldukları için gebelik çağındaki kadınları içeren ulusal HBV aşılama politikalarının geliştirilmesi gerekmektedir. Ülkemizde HBV ve HCV bulaşmasını önlemek için özellikle riskli gruplar olan genç erişkinlere enfeksiyon taraması ve eğitim verilmesi gereklidir.

Anahtar Kelimeler: Anti-HCV, anti-HBs, HBsAg, Suriyeli, Türk

Cite this article as: Karadağ Gencer S. Comparison of Hepatitis B and Hepatitis C Seropositivity of the Syrian Immigrant and Turkish Local People. Viral Hepatitis Journal 2022;28(1):32-37

Address for Correspondence: Sanem Karadağ Gencer MD, University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital, Clinic of Microbiology and Clinical Microbiology, Bursa, Turkey

Phone: +90 224 360 50 50 **E-mail:** sanemkaradag@yahoo.com **ORCID ID:** orcid.org/0000-0002-3567-4262 **Received:** 13.12.2020 **Accepted:** 03.01.2022

©Copyright 2022 by Viral Hepatitis Society / Viral Hepatitis Journal published by Galenos Publishing House.

Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are viral pathogens that can cause chronic hepatitis, liver cirrhosis and hepatocellular cancer (1). HBV affects approximately two billion people worldwide. The World Health Organization (WHO) is located Turkey in moderate endemicity region of HBV with 2-8% incidence rate (2). It has been determined that approximately 170 million people are infected with HCV all over the world and HCV seropositivity is 1-2.4% in our country (3,4). HBV and HCV can be transmitted by parenteral contact with infected blood and body fluids, sexually and directly from infected mother to baby (5). With the immigration caused by the civil war that started in Syria in 2011, a total of 3,607,563 Syrians, 162,471 in Bursa as of 2018, are living in temporary refugee status in our country (6). Many studies have emphasized the increase in infectious disease rates in asylum seekers fleeing war due to difficult migration conditions and inadequate living conditions (7,8,9).

In our study, we aimed to compare the hepatitis B surface antigen (HBsAg), anti-HBs, anti-HCV positivity of local Turkish patients and Syrian patients living under temporary protection status in our region admitted to our hospital by age groups and gender and to evaluate the seroprevalence of hepatitis B and C.

Materials and Methods

In our study, the HBsAg, anti-HBs and anti-HCV test results of Syrian and Turkish patients admitted to University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital between January 2016 and December 2017 were compared. HBsAg test results of 124,203 patients (10,834 Syrians and 113,369 Turk); anti-HBs test results of 87,236 patients (7,457 Syrians and 79,779 Turk); anti-HCV test results of 116,777 patients (10,505 Syrians and 106,272 Turk) who applied to our hospital were evaluated. HBsAg, anti-HBs and anti-HCV positivity of the patients were determined according to sex and age groups (<9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, 90-99). HBsAg, anti-HBs and anti-HCV positivity of the patients were also grouped into pediatric (<18) and adult (18) age groups. The presence of HBsAg, anti-HBs and anti-HCV antibodies was detected by Chemiluminescent Microparticle Immunoassay method in a fully automated COBAS 4000 device from serum samples obtained by separating 10 cc blood samples of the patients by centrifugation (Roche Diagnostics, Germany). With the manufacturer's recommendation, samples with HBsAg and anti-HCV values below 1 IU/mL were considered negative and samples with 1 IU/L values were considered positive, anti-HBs values below 10 IU/mL were negative, and ≥ 10 IU/mL positive.

Statistical Analysis

Statistical analyzes were performed using Pearson chi-square and Fisher's chi-square method in SPSS-20 program. $P < 0.01$ and $p < 0.05$ values were considered statistically significant. This study was approved by University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital Research Ethic Committee (approval number: 2011-KAEK-25 2020/10-5).

Results

In our study, HBsAg positivity of Syrian and Turkish patients were compared according to age groups (Table 1). HBsAg positivity was significantly higher in Turkish patients (2.4%, 4.2%) compared to Syrian patients (1.5%, 3.2%) in the 20-29 and 30-39 age groups ($p < 0.01$, $p < 0.05$) (Table 1). Additionally, HBsAg positivity was found to be significantly higher in Turkish patients (4.7%) than Syrian patients (2.5%) in the adult age group ($p < 0.01$) (Table 1).

Anti-HBs positivity of Syrian and Turkish patients were compared according to age groups in our study (Table 2). Anti-HBs positivity (79.4%, 56.9%, 66.2%, 25.7%) was significantly higher in Turkish patients than Syrian patients (66.0%, 39.5%, 24.0%, 20.4%) in 0-9, 10-19, 20-29, 30-39 age groups ($p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$) (Table 2). Anti-HBs positivity was significantly higher in Syrian patients (56.3%, 65.3%) than Turkish patients (41.3%, 45.2%) in the 60-69, 80-89 age groups ($p < 0.01$, $p < 0.01$) (Table 2). In addition, anti-HBs positivity was significantly higher in Turkish patients (68.3%, 42.4%) than Syrian patients (59.7%, 27.1%) in the pediatric and adult age groups ($p < 0.01$, $p < 0.01$) (Table 2).

Anti-HCV positivity of Syrian and Turkish patients were compared according to age groups in our study (Table 3). Anti-HCV positivity was significantly higher in Syrian patients than Turkish patients (0.0%, 0.1%, 0.2%, 0.3%, 0.5%, 0.8%, 0.9%) in the 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 age groups (0.5%, 0.5%, 1.4%, 2.8%, 4.9%, 1.9%, 4.0%) ($p < 0.05$, $p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$). In addition, anti-HCV positivity was significantly higher in Syrian patients (0.9%, 1.2%) than Turkish patients (0.1%, 0.4%) in the pediatric and adult patient groups ($p < 0.01$, $p < 0.01$).

In our study, HBsAg, anti-HBs, anti-HCV antibody positivity of Syrian and Turkish patients were compared according to gender (Table 4). HBsAg positivity was statistically significantly higher in Syrian and Turk patients among males (5.9%, 6.7%) than females (1.7%, 3.5%) ($p < 0.01$, $p < 0.01$). Also, HBsAg positivity was significantly higher in Turkish female patients (3.5%) than Syrian female patients (1.7%) ($p < 0.01$). There was no significant difference in HBsAg positivity between Syrian and Turkish men (Table 4).

Anti-HBS positivity was statistically significantly higher in Syrian and Turk patients among males (42.6%, 47.0%) than females (26.1%, 42.0%) ($p < 0.01$, $p < 0.01$). In addition, anti-HBs positivity was significantly higher in Turkish males (47.0%) than Syrian males (42.6%) and Turkish females (42.0%) than Syrian females (26.1%) ($p < 0.01$, $p < 0.01$) (Table 4).

Anti-HCV positivity was significantly higher in Syrian and Turk male patients (2.5%, 0.4%) than female patients (0.9%, 0.3%) ($p < 0.01$, $p < 0.05$). In addition, anti-HCV positivity was significantly higher in Syrian males (2.5%) than Turkish males (0.4%) and Syrian females (0.9%) than Turkish females (0.3%) ($p < 0.01$, $p < 0.01$) (Table 4).

Discussion

According to our study, HBsAg, anti-HBs and anti-HCV positivity rates of Syrian immigrants and Turks were found to be compatible with recent studies. In a study, HBsAg positivity

Table 1. Comparison of the HBsAg results of Syrian and Turkish patients by age groups

Age groups	Nationality	HBsAg		p
		Negative (n, %)	Positive (n, %)	
0-9	Syrian	323 (99.7%)	1 (0.3%)	0.714
	Turk	1997 (99.5%)	11 (0.5%)	
10-19	Syrian	748 (99.5%)	4 (0.5%)	0.127
	Turk	3943 (98.8%)	49 (1.2%)	
20-29	Syrian	5435 (98.5%)	80 (1.5%)	0.001**
	Turk	26464 (97.6%)	641 (2.4%)	
30-39	Syrian	2512 (96.8%)	84 (3.2%)	0.017*
	Turk	26482 (95.8%)	1164 (4.2%)	
40-49	Syrian	671 (94.2%)	41 (5.8%)	0.397
	Turk	15801 (93.4%)	1117 (6.6%)	
50-59	Syrian	350 (92.1%)	30 (7.9%)	0.468
	Turk	11397 (90.9%)	1142 (9.1%)	
60-69	Syrian	312 (95.7%)	14 (4.3%)	0.279
	Turk	10366 (94.2%)	634 (5.8%)	
70-79	Syrian	145 (97.3%)	4 (2.7%)	0.663
	Turk	7757 (96.4%)	290 (3.6%)	
Pediatric	Syrian	597 (99.7%)	2 (0.3%)	0.163
	Turk	4553 (99.0%)	44 (1.0%)	
Adult	Syrian	9979 (97.5%)	256 (2.5%)	0.001**
	Turk	103651 (95.3%)	5121 (4.7%)	

HBsAg: Hepatitis B surface antigen, **p<0.01, *p<0.05

Table 2. Comparison of anti-HBs results of Syrian and Turkish patients by age groups

Age groups	Nationality	Anti-HBs		p
		Negative (n, %)	Positive (n, %)	
0-9	Syrian	99 (34.0%)	192 (66.0%)	0.001**
	Turk	403 (20.6%)	1,558 (79.4%)	
10-19	Syrian	352 (60.5%)	230 (39.5%)	0.001**
	Turk	1,735 (43.1%)	2,289 (56.9%)	
20-29	Syrian	2,747 (76.0%)	869 (24.0%)	0.001**
	Turk	5,789 (33.8%)	11,351 (66.2%)	
30-39	Syrian	1,289 (79.6%)	331 (20.4%)	0.001**
	Turk	12,108 (74.3%)	4,180 (25.7%)	
40-49	Syrian	377 (69.4%)	166 (30.6%)	0.125
	Turk	7,836 (66.2%)	4,008 (33.8%)	
50-59	Syrian	188 (59.7%)	127 (40.3%)	0.192
	Turk	6,055 (63.3%)	3,511 (36.7%)	
60-69	Syrian	124 (43.7%)	160 (56.3%)	0.001**
	Turk	5,112 (58.7%)	3,601 (41.3%)	
70-79	Syrian	66 (48.5%)	70 (51.5%)	0.054
	Turk	3,775 (57.0%)	2,843 (43.0%)	
80-89	Syrian	17 (34.7%)	32 (65.3%)	0.006**
	Turk	1,726 (54.8%)	1,422 (45.2%)	
90-99	Syrian	10 (58.8%)	7 (41.2%)	0.627
	Turk	237 (51.5%)	223 (48.5%)	
Pediatric	Syrian	205 (40.3%)	304 (59.7%)	0.001**
	Turk	1,468 (31.7%)	3,169 (68.3%)	
Adult	Syrian	5,066 (72.9%)	1,882 (27.1%)	0.001**
	Turk	43,318 (57.6%)	31,824 (42.4%)	

*P<0.05, **p<0.01, HBs: Hepatitis B surface

3.8%, 4.6%, 3.2%, 10%, anti-HBs positivity 41%, 10.7%, 12.9%, 40% and anti-HCV positivity were 1.2%, 1.5%, 6.4%, 2.8% found in Syrian immigrants aged 0-15, 16-40, 41-50 and > 50 (10). Yalçın Bahat et al. (11) established that HBsAg and anti-HCV seropositivity rates in Syrian pregnant women were found to be 1.1% and 0.1%, respectively. İnci et al. (12) determined that HBsAg positivity was found to be 1.8% in pregnant Syrian women and 1.1% in Turkish pregnant women. In a study, anti-HCV positivity was found 3-10% and HBsAg positivity 6% in Syrians (13). Bashour and Muhjazi (14) showed that HCV

seroprevalence in Syrians was varied between 2-10% according to anti-HCV test values and hepatitis B seroprevalence was varied between 5-10% according to HBsAg test values. HBsAg positivity was found 1.01% to 4.6% and anti-HCV positivity was determined between 0.4% and 1.57% in studies from different regions in Turkey (15,16,17,18). Significantly higher HBsAg positivity among Turkish people than Syrians in young adult and adult age groups in our study was showed that Turkish people were infected with HBV more than Syrians in young adult and adult age groups ($p < 0.01$, $p < 0.05$). Also, determination of higher

Table 3. Comparison of anti-HCV results of Syrian and Turkish patients by age groups

Age groups	Nationality	Anti-HCV		p
		Negative (n, %)	Positive (n, %)	
0-9	Syrian	302 (99.3%)	2 (0.7%)	0.216
	Turk	1760 (99.8%)	4 (0.2%)	
10-19	Syrian	663 (99.5%)	3 (0.5%)	0.021*
	Turk	3001 (100.0%)	1 (0.0%)	
20-29	Syrian	5348 (99.5%)	28 (0.5%)	0.000**
	Turk	25316 (99.9%)	37 (0.1%)	
30-39	Syrian	2515 (98.6%)	36 (1.4%)	0.000**
	Turk	25784 (99.8%)	47 (0.2%)	
40-49	Syrian	688 (97.2%)	20 (2.8%)	0.000**
	Turk	15985 (99.7%)	41 (0.3%)	
50-59	Syrian	366 (95.1%)	19 (4.9%)	0.000**
	Turk	11816 (99.5%)	62 (0.5%)	
60-69	Syrian	303 (98.1%)	6 (1.9%)	0.035*
	Turk	10636 (99.2%)	81 (0.8%)	
70-79	Syrian	143 (96.0%)	6 (4.0%)	0.003**
	Turk	7962 (99.1%)	75 (0.9%)	
80-89	Syrian	54 (94.7%)	3 (5.3%)	0.061
	Turk	3605 (98.5%)	56 (1.5%)	
Pediatric	Syrian	528 (99.1%)	5 (0.9%)	0.003**
	Turk	3615 (99.9%)	4 (0.1%)	
Adult	Syrian	9854 (98.8%)	118 (1.2%)	0.000**
	Turk	102253 (99.6%)	400 (0.4%)	

* $P < 0.05$, ** $p < 0.01$. HCV: Hepatitis C virus

Table 4. Comparison of the HBsAg, anti-HBs, anti-HCV antibody results of Syrian and Turkish patients by gender

Test		Syrian		Turk		p
		Male (n, %)	Female (n, %)	Male (n, %)	Female (n, %)	
HBsAg	Negative	1620 (94.2%)	8956 (98.3%)	34697 (93.3%)	73507 (96.5%)	0.001** 0.001** 0.139 0.001**
	Positive	100 (5.8%)	158 (1.7%)	2507 (6.7%)	2658 (3.5%)	
Anti-HBs	Negative	826 (57.4%)	4445 (73.9%)	15680 (53.0%)	29105 (58.0%)	0.001** 0.001** 0.001** 0.001**
	Positive	613 (42.6%)	1573 (26.1%)	13902 (47.0%)	21091 (42.0%)	
Anti-HCV	Negative	1611 (97.5%)	8771 (99.1%)	34430 (99.6%)	71438 (99.7%)	0.001** 0.017* 0.001** 0.001**
	Positive	42 (2.5%)	81 (0.9%)	154 (0.4%)	250 (0.3%)	

* $P < 0.05$, ** $p < 0.01$. HBsAg: Hepatitis B surface antigen, HCV: Hepatitis C virus

anti-HBs positivity in Turkish patients than Syrian patients in children, young adults and adult age groups in our study shows that hepatitis B immunity is significantly higher in children, young adults and adult age groups in Turks than Syrians ($p < 0.01$, $p < 0.01$). More common hepatitis B infection among Turks than Syrians in age groups with high contact risk shows that Syrians are more susceptible to hepatitis B infection and have a higher risk of contracting the hepatitis B infection.

Chronic HBV and HCV infection was determined after perinatal HBV and HCV transmission in 90% of newborns, in 20-50% of 1-5 age group, in 5-10% of >5 years (19,20). Chronic HBV and HCV infections can cause serious health problems such as liver cirrhosis and hepatocellular cancer (21). In our country, hepatitis B vaccine has been administered to babies in the routine vaccination program since 1998 as 3 doses at 0, 1 and 6 months. Although hepatitis B vaccine has been in the national vaccination program since 1993 in Syria, the necessary importance was not shown in the vaccination of children; it has been stated that safe and effective vaccination and education are required to prevent hepatitis B infection (22). In addition, studies have emphasized that the prevalence of HBV and HCV infection is high in Syria due to critical security, economic conditions, low infection control and deficiencies in hygienic practices (23,14). Our study shows that Syrians have lower HBV vaccination rates than Turks. Therefore, it is necessary to develop national HBV vaccination policies for Syrian immigrants, which include women of gestational age, as young adults are particularly at risk for the transmission of hepatitis B infection. Also, higher anti-HCV positivity in Syrian patients than Turkish patients in the pediatric and adult age groups shows that Turks are more susceptible to infection and more risky in terms of contracting HCV infection.

Study Limitations

The limitation of our study is that the HBV vaccination history of Syrian and Turkish patients, and the history of HBV and HCV infection were not examined.

Conclusion

According to our study, necessary precautions should be taken to prevent the increase of HBV and HCV infection in our country. For this purpose, it is necessary to provide infection screening and training to young adults, especially pregnant women, who are at risk groups in our country to prevent HBV and HCV transmission.

Ethics

Ethics Committee Approval: This study was approved by University of Health Sciences Turkey, Bursa Yüksek İhtisas Training and Research Hospital Research Ethic Committee (approval number: 2011-KAEK-25 2020/10-5).

Informed Consent: It was obtained.

Peer-review: Externally peer-reviewed.

Financial Disclosure: The author declare no financial support.

References

- Hughes E, Bassi S, Gilbody S, Bland M, Martin F. Prevalence of HIV, hepatitis B and hepatitis C in people with severe mental illness: a systematic review and meta-analysis. *Lancet Psychiatry*. 2016;3:40-48.
- Toy M, Önder FO, Wörmann T, Bozdayı AM, Schalm SW, Borsboom GJ, van Rosmalen J, Richardus JH, Yurdaydin C. Age and region-specific hepatitis B prevalence in Turkey estimated using generalized linear mixed models: a systematic review. *BMC Infect Dis*. 2011;11:337.
- Yıldırım M, Çakır S, Geyik MF, Özdemir D, Güçlü E, Çakır M. Seroprevalences and associated risk factors of hepatitis B and C in adults. *Turk J Med Sci*. 2014;44:824-831.
- Ampuero J, Romero-Gómez M, Reddy KR. Review article: HCV genotype 3 - the new treatment challenge. *Aliment Pharmacol Ther*. 2014;39:686-698.
- Köse S, Ödemiş I, Çelik D, Gireniz Tatar B, Akbulut I, Çiftdoğan DY. Hepatitis A, B, C and HIV seroprevalence among Syrian refugee children admitted to outpatient clinics. *Infez Med*. 2017;25:339-343.
- GİGM. Gecici Koruma T.C. İçişleri Bakanlığı Goc İdaresi Genel Müdürlüğü; 2018 [cited 2018 04/09/]. Available from: http://www.goc.gov.tr/icerik6/gecici-koruma_363_378_4713_icerik
- Doni NY, Simsek Z, Gurses G, Zeyrek FY, Aksoy M, Hilali NG, Yıldırım G. Community-Based Assessment to Determine the Seroprevalence of HBsAg, Anti-HBs, Anti-HCV, HIV, and Syphilis for Reproductive-Aged Female Syrian Refugees Living in Sanliurfa, Turkey. *Clin Infect Immun*. 2018;3:45-51.
- Nimer NA. A Review on emerging and reemerging of infectious diseases in Jordan: the aftermath of the Syrian crises. *Can J Infect Dis Med Microbiol*. 2018;2018:8679174.
- İnci A, Sarıcı İŞ, Çalışkan G, Kalaycı MU. Investigation of frequency of HBsAg, anti-HBs, anti HCV and anti HIV in refugee patients from Syria who admit to a training and research hospital department of surgery. *Acta Medica Mediterranea*. 2017;33:59-63
- Tümtürk A, Yeşil B. Hepatitis B, hepatitis C and HIV seroprevalence among Syrian refugees: A cross-sectional study from a tertiary referral center in Turkey. *J Surg Med*. 2019;3:845-847.
- Yalçın Bahat P, Turan G, Yüksel Özgör B, Bağcı Çakmak K. Comparison of hepatitis B, hepatitis C, and HIV seropositivity of Syrian and Turkish pregnant women. *Turk J Obstet Gynecol*. 2019;16:95-99.
- İnci A, Yıldırım D, Seçkin KD, Gedikbaşı A. Analysis of HbsAg positivity rate before and after vaccination in Turkish and Syrian refugee pregnant women. *J Infect Dev Ctries*. 2017;11:815-818.
- Othman BM, Monem FS. Prevalence of hepatitis C virus antibodies among health care workers in Damascus, Syria. *Saudi Med J*. 2001;22:603-605.
- Bashour H, Muhjazi G. Hepatitis B and C in the Syrian Arab Republic: a review. *East Mediterr Health J*. 2016;22:267-273.
- İnci A, Güven D, Okay M. HBsAg, Anti-HBs, Anti-HCV and anti-HIV Seroprevalence of the patients applied to Artvin State Hospital. *Viral Hepat J*. 2013;19:41-44.
- Öner S, Yapıcı G, Şaşmaz CT, Kurt AO, Buğdaycı R. Hepatitis B, hepatitis C, HIV, and VDRL seroprevalence of blood donors in Mersin, Turkey. *Turk J Med Sci*. 2011;41:335-341.
- Denk A, Özer Balın Ş. Seropositivity of HBsAg, Anti-HCV and Anti-HIV in Patients Undergoing Coronary Angiography. *Firat Med J*. 2016;21:125-128.
- Köse Ş, Ersan G, Liv F. Six-Year Analysis of the Seropositivity of HBV, HCV, HIV, and Syphilis in Volunteer Blood Donors Attending Our Blood Center. *Viral Hepat J*. 2015;21:28-30.
- Scotto G. Globalization and infectious diseases: the past and future. *Infez Med*. 2011;19:56-61.
- Mıstık R, Balık İ. Türkiye'de viral hepatitlerin epidemiyolojik analizi. In: Tekeli E, Balık İ, (Eds). *Viral Hepatit Savaşım Derneği: Ankara: Viral Hepat J*. 2003, p. 10-45.

21. Köse Ş, Ödemiş I, Çelik D, Tatar BG, Akbulut I, Çiftdoğan DY. Hepatitis A, B, C and HIV seroprevalence among Syrian refugee children admitted to outpatient clinics. *Infez Med.* 2017;25:339-343.
22. Ibrahim N, Idris A. Hepatitis B awareness among medical students and their vaccination status at Syrian Private University. *Hepat Res Treat.* 2014;2014:131920.
23. Karim M, Laham H. Prevalence of viral hepatitis B and C in Syria. *Syrian Epidemiol Bull.* 2008;3:10-11.