

Determination of hepatitis B and hepatitis C seroprevalence in pregnant women in the Kastamonu region, Turkey

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ABSTRACT

Aims: Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections during pregnancy have a risk of transmission to the newborn. Therefore, pregnant women are routinely screened for HBV and HCV in many countries. This study aimed to reveal the seroprevalence of HBsAg, anti-HBs, and anti-HCV in pregnant women in the Kastamonu region and to compare the obtained data with the results of studies conducted in Turkey.

Methods: Pregnant women who applied to Kastamonu Training and Research Hospital Microbiology laboratory between January 2022 and January 2023 for HBsAg, anti-HBs, and anti-HCV tests were included in this study. The pregnant women were separated into two groups ≤ 24 and > 24 age groups. The tests were performed using the chemiluminescence microparticle immune assay method on the Abbott Architect i2000SR instrument, and the results were evaluated per the manufacturer's instructions.

Results: HBsAg, anti-HBs, and anti-HCV positivity were 0.5% (n=9/1712), 51.1% (n=874/1712), and 0.1% (n=2/1713), respectively. While there was no significant difference between age groups for HBsAg positivity ($p > 0.05$), anti-HBs positivity was found to be significantly higher in the ≤ 24 age group than in the > 24 age group ($p = 0.002$).

Conclusion: The results showed that HBsAg and anti-HCV positivity was lower than in most studies conducted in recent years in Turkey, and anti-HBs positivity was higher than in most studies. It is essential to continue routine HBV and HCV screening in pregnant women's first follow-up and encourage anti-HBs-negative individuals to be vaccinated against HBV.

Keywords: Anti-HBs, anti-HCV, HBsAg, pregnancy

INTRODUCTION

Hepatitis B virus (HBV) is a partially double-stranded DNA virus found in the *Orthohepadnavirus* genus of the *Hepadnaviridae* family.¹ HBV infection can range from asymptomatic carrier to fulminant hepatitis B. Besides, the disease can have a chronic course in children and asymptomatic infected individuals. Chronic infection can result in cirrhosis and/or hepatocellular carcinoma.² The World Health Organization (WHO) reported that there are about 296 million cases of chronic hepatitis B in the world, and about 820,000 people die annually as a result of cirrhosis and/or hepatocellular carcinoma.³ HBV can be transmitted from person to person through sexual contact, transfusion of contaminated blood and blood products, and perinatally.⁴ It is known that the risk of HBV transmission from a mother with a high viral load to the infant is 70-90%, and the disease becomes chronic in the future in 95% of these infants. On the other hand, the chronicity rate of acute hepatitis B disease

in adult individuals is below 5%.⁵ Therefore, the history of acquaintance with the virus in most chronic hepatitis B patients goes back to the perinatal period.

Hepatitis C virus (HCV) is a positive-polarity, single-stranded RNA virus found in the *Hepacivirus* genus of the *Flaviviridae* family.¹ HCV can cause acute and chronic hepatitis C disease, as well as a series of extrahepatic disorders (lymph nodes, thyroid, skin, kidney, etc.).^{5,6} WHO reported that about 58 million people worldwide have chronic hepatitis C disease and about 290,000 die annually due to hepatitis C complications. HCV is transmitted from person to person mainly by transfusion of contaminated blood and blood product.⁵ Sexual and perinatal transmission can also be seen depending on viral load. The transmission rate of the virus from infected mother to infant is reported as 5-15%, and in 3-5% of these infants, the infection has a chronic course in the future.¹

Screening of pregnant women for HBV and HCV guides the determination of the immunoprophylaxis and treatment

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protocol to be applied to the newborn. Indeed, the hepatitis B surface antigen (HBsAg), anti-hepatitis B surface antigen (anti-HBs), and anti-hepatitis C (anti-HCV) tests are routinely performed in the first follow-up of pregnancy in Turkey. Furthermore, the HBV vaccine is suggested for anti-HBs negative pregnant women.⁷

Recent studies reported that HBsAg positivity was in the range of 0.7-4.0%, and anti-HCV positivity was in the range of 0.06-0.6% in pregnant women in Turkey.⁸⁻²⁹ These rates may vary based on geographical regions and provinces. There is no data on hepatitis B and hepatitis C seroprevalence in the pregnant population in the Kastamonu region of northwest Turkey in the literature. This study aimed to reveal the seroprevalence of HBsAg, anti-HBs, and anti-HCV in pregnant women in the Kastamonu region and to compare the obtained data with the results of studies conducted in different regions of Turkey.

METHODS

The study was carried out with the permission of the Kastamonu University Clinical Researches Ethics Committee (Date: 21.09.2022; Decision No: 2022-KAEK-91). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The test results of pregnant women who applied to the Kastamonu Training and Research Hospital Microbiology laboratory from January 2022 to January 2023 for HBsAg, anti-HBs, and anti-HCV tests were retrospectively analyzed in the current study. The blood samples sent to the laboratory were centrifuged at 4000 rpm for 20 min, and serum was obtained. HBsAg, anti-HBs, and anti-HCV values in the serum samples were examined using the chemiluminescence microparticle immune assay method on the Abbott Architect i2000SR instrument, and the results were evaluated per the manufacturer's instructions. The following values were considered to be negative and positive, respectively, in the tests: for HBsAg and anti-HCV <1.0 S/CO and ≥ 1.0 S/CO; for anti-HBs <10.0 mIU/mL and ≥ 10.0 mIU/mL.

Statistical Analysis

Pregnant women were divided into two groups ≤ 24 years (born in ≥ 1998 years) and >24 years (born in <1998). The distribution of HBsAg and anti-HBs positivity between age groups was evaluated using the Pearson chi-square test using SPSS 23.0 (IBM Inc., Armonk, NY, USA) for Windows. The statistical significance level was accepted as $p < 0.05$.

RESULTS

HBsAg and anti-HBs test results of 1712 pregnant women and anti-HCV test results of 1715 pregnant women were analyzed between January 2022 and January 2023. The mean age of the pregnant women was 28.1 ± 5.5 (min. 15, max. 45). HBsAg, anti-HBs, and anti-HCV positivity were 0.5% ($n=9/1712$), 51.1% ($n=874/1712$), and 0.1% ($n=2/1713$), respectively (Table 1).

Table 1. Seroprevalence of HBsAg, anti-HBs, and anti-HCV in pregnant women in Kastamonu province

	HBsAg	Anti-HBs	Anti-HCV
Positive, n (%)	9 (0.5%)	874 (51.1%)	2 (0.1%)
Negative, n (%)	1703 (99.5%)	838 (48.9%)	1713 (99.90%)
Total, n (%)	1712 (100%)	1712 (100%)	1715 (100%)

HBsAg: Hepatitis B surface antigen, Anti-HBs: Anti-Hepatitis B surface antigen, Anti-HCV: Anti-Hepatitis C virus, n: Number

Of the pregnant women who were screened for HBsAg and anti-HBs, 480 (28.0%) were ≤ 24 , and 1232 (72.0%) were in the >24 age group. HBsAg and anti-HBs positivity in age groups are presented in Table 2.

Table 2. HBsAg and anti-HBs positivity in ≤ 24 and >24 years age groups			
Age group	HBsAg, n (%)*	Anti-HBs, n (%)**	Sample size, n (%)
≤ 24	2 (0.4%)	274 (57.1%)	480 (28.0%)
>24	7 (0.6%)	600 (48.7%)	1232 (72.0%)
Total	9 (0.5%)	874 (51.1%)	1712 (100%)

HBsAg: Hepatitis B surface antigen, Anti-HBs: Anti-Hepatitis B surface antigen, n: Number, * $p > 0.05$, ** $p = 0.002$, ≤ 24 : Born in ≥ 1998 years, >24 : Born in <1998 years

There was no statistically significant difference between age groups for HBsAg positivity ($p > 0.05$). However, while anti-HBs positivity was 57.1% in the ≤ 24 age group, it was 48.7% in the >24 age group ($p = 0.002$).

DISCUSSION

Due to the risk of perinatal transmission of HBV and HCV, it is significant to detect mothers infected with these viruses and to take necessary prevention methods. In addition, it can be beneficial to determine the regional prevalence rates of these infectious agents to increase the knowledge and awareness of the public. The present study revealed the seroprevalence of HBsAg, anti-HBs, and anti-HCV in pregnant women in the Kastamonu region of northwest Turkey.

HBsAg is the surface antigen of HBV. Detection of HBsAg positivity in the serum sample indicates that the individual is infected with HBV and can transmit the virus to other individuals.³⁰ Based on WHO, HBsAg positivity has been reported at a rate of 3.8% worldwide. The highest HBsAg positivity has been reported from the Western Pacific region and the lowest from the Americas.³¹ This rate has been reported as about 5.0% (ranging from 0.6% to $>20\%$) in the pregnant population.³² Based on WHO, Turkey has been in the moderate endemicity category for HBV infections, and HBsAg positivity has been reported at about 4.0% in the general population. In studies conducted in various regions of Turkey in the last ten years (2012-2022), HBsAg positivity in pregnant women has been reported in the range of 0.7-4.0% (Table 3). The highest positivity rate was stated in Zonguldak (4.0%)⁸, and the lowest was in Karabük (0.7%).²⁶ HBsAg positivity was detected at the rate of 0.5% in 1712 pregnant women screened in Kastamonu, and this result was lower than the results of most studies conducted in various regions of Turkey. The reason for this low rate may be the public's awareness about the methods of protection against infection and the vaccines, which are our most important weapon in the fight against HBV.

HBV vaccine is a subunit vaccine produced with recombinant DNA technology and contains only HBsAg antigen. The immune system responds to HbsAg by forming anti-HBs antibodies.³³ Alone anti-HBs positivity in a serum sample indicates vaccine-induced acquired immunity, whereas anti-HBc IgG (IgG-type antibody formed against the core antigen of HBV) and anti-HBs positivity indicate acquired immunity due to the past infection.³⁴ In studies conducted in various regions of Turkey in the last ten years (2012-2022), anti-HBs positivity in pregnant women has been reported in the range of 7.3-52.0% (Table 3). Anti-HBs positivity was 51.1% of the pregnant women included in the current study. HBV vaccine has been used in the national vaccination calendar since 1998

in Turkey, and it is administered free of charge to newborns at the 0th, 1st, and 6th months.³⁵ Therefore, it is expected that HBsAg positivity will be lower and anti-HBs positivity higher in pregnant women born in ≥ 1998 compared to those born in < 1998 . Pregnant women were separated into two groups ≤ 24 (born in ≥ 1998) and > 24 (born in < 1998) years in this study. HBsAg positivity was at a rate of 0.4% and 0.6% in ≤ 24 and > 24 age groups, respectively. However, anti-HBs positivity was significantly higher in the ≤ 24 age group, as expected. As in this study, Özcan Dağ et al.⁹, Erin et al.²³, Şahin et al.²⁵, and Öner et al.²⁷ reported that the rate of anti-HBs positivity was higher in young pregnant women and attributed this to the success of the national vaccination program.

The anti-HCV test is a serological test that investigates antibodies against HCV and is used in hepatitis C screening. The test has 100% sensitivity and 99.6% specificity.³⁶ However, its positivity cannot distinguish acute, chronic, or past infections. Therefore, recombinant immunoblot assay (RIBA) and HCV-RNA tests should be performed when anti-HCV positivity is detected to distinguish the infection time.³⁷ The global prevalence of HCV infection is estimated to be about 0.8%. The highest anti-HCV positivity has been reported from the Eastern Mediterranean and European countries and the lowest from the Americas.³⁰ Although the rate of anti-HCV positivity in pregnant women varies within regions, it has been reported in the range of 0.1% to 3.6% worldwide.³⁸

Table 3. Studies conducted in the last decade in various regions of Turkey on HBsAg, anti-HBs, and anti-HCV seroprevalence in pregnant women						
Research	HBsAg (%)	Anti-HBs (%)	Anti-HCV (%)	Sample size (n)	Period	Center
Aynioğlu et al. ⁸	4.0	7.0	0.6	1084	January 2012- January 2014	Zonguldak
Özcan Dağ et al. ⁹	3.5	45.8	0.4	8442 (HBsAg) 3094 (anti-HBs) 8120 (anti-HCV)	June 2012- June 2014	Kırıkkale
Bayindir Bilman et al. ¹⁰	1.2	-	-	166627	January 2012- May 2017	Multicenter (Afyon, Erzurum, İstanbul, İzmir, Manisa, Muş, Rize)
Yalçın Bahat et al. ¹¹	1.7	20.6	0.3	79184 (HBsAg) 7310 (anti-HBs) 78764 (anti-HCV)	January 2012- January 2018	Küçükçekmece/İstanbul
Sert et al. ¹²	1.1	31.5	0.1	72610 (HBsAg) 17584 (anti-HBs) 50614 (anti-HCV)	January 2012- January 2019	Ankara
Çınar Tanrıverdi et al. ¹³	1.2	27.7	0.06	35295 (HBsAg) 34489 (anti-HBs) 9709 (anti-HCV)	January 2013- December 2016	Erzurum
Kasap et al. ¹⁴	1.8	23.7	0.3	333	June 2014- February 2015	Muğla
Guckan et al. ¹⁵	0.9	29.6	0.12	5540 (HBsAg) 4752 (anti-HBs) 5540 (anti-HCV)	January 2014- November 2015	Amasya
Alay et al. ¹⁶	1.2	-	-	26925	January 2014- January 2016	Erzurum
Altuğlu et al. ¹⁷	1.4	-	0.4	8967 (HBsAg) 8865 (anti-HCV)	January 2014- July 2017	İzmir
Erdoğan et al. ¹⁸	1.1	-	-	54201	January 2014- January 2018	Kahramanmaraş
Kale et al. ¹⁹	1.5	34.6	0.3	55639 (HBsAg) 11263 (anti-HBs) 47990 (anti-HCV)	January 2014- January 2020	Ümraniye/İstanbul
İnci et al. ²⁰	1.4	-	-	4186	January 2015- January 2016	Küçükçekmece/ İstanbul
Uçkan et al. ²¹	2.3	-	0.6	8464 (HBsAg) 8419 (anti-HCV)	January 2015- January 2019	Van
Çetin et al. ²²	2.1	-	-	475	May 2016- December 2016	Antakya/Hatay
Erin et al. ²³	3.8	49.5	0.09	10449	January 2016- January 2019	Trabzon
Karbancı-oğlu Cantürk et al. ²⁴	0.9	-	-	348	January 2017- January 2018	Kırşehir
Şahin et al. ²⁵	1.0	27.8	0.2	2214	April 2017- October 2017	Şırnak
Mutlu and Yılmaz ²⁶	0.7	37.2	0.1	3382	January 2017- January 2019	Karabük
Öner et al. ²⁷	1.5	52.0	0.2	1361	December 2018- December 2019	Tokat
Beyazgül et al. ²⁸	1.4	-	-	44523	January 2019- January 2020	Şanlıurfa
Aksin et al. ²⁹	2.6	16.2	0.4	1224 (HBsAg) 1359 (anti-HBs) 1231 (anti-HCV)	January 2020- August 2020	Diyarbakır
This study	0.5	51.1	0.1	1712 (HBsAg) 1712 (anti-HBs) 1715 (anti-HCV)	January 2022- January 2023	Kastamonu

HBsAg: Hepatitis B surface antigen, Anti-HBs: Anti-Hepatitis B surface antigen, Anti-HCV: Anti-Hepatitis C virus, n: Number, -: Not specified

Anti-HCV positivity has been reported at a rate of about 1.2% in the general population in Turkey.³⁹ In studies conducted in various regions of Turkey in the last ten years (2012-2022), anti-HCV positivity in pregnant women has been reported in the range of 0.06-0.6% (Table 3). The highest positivity rate was reported in Zonguldak (0.6%)⁸, and the lowest in Erzurum (0.06%).¹³ Anti-HCV positivity was found in only two of the 1715 pregnant women (0.1%) screened in the Kastamonu region.

The limitation of this study is that the gestational age, gravida, and parity numbers of the pregnant women were not determined. In addition, anti-HBc seroprevalence was not investigated in this study. Therefore, it was not differentiated whether the immunity of anti-HBs positive pregnant women was due to vaccination or past infection.

CONCLUSION

Kastamonu Training and Research Hospital is the central hospital of the Kastamonu region. The results showed that HBsAg and anti-HCV positivity was lower than in most studies conducted in recent years in Turkey, and anti-HBs positivity was higher than in most studies. Since these infections continue to be seen in Turkey, it is important to routinely screen pregnant women for these agents and to encourage anti-HBs-negative individuals to be vaccinated against HBV.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of the Kastamonu University Clinical Researches Ethics Committee (Date: 21.09.2022, Decision No: 2022-KAEK-91).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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