Seroprevalence of hepatitis B, hepatitis C, and HIV in pregnant women from Eastern Turkey

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ABSTRACT

Background/Aims: The vertical transmission of hepatitis B virus, hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infections are essential public health problems. In this study, we aimed to investigate the seroprevalence of the aforementioned infections among pregnant women.

Materials and Methods: This study was done retrospectively on pregnant women who presented for antenatal follow-up and delivery between 2013 and 2016. Data were collected from the hospital's electronic health records and patient files. Blood samples were analyzed at the microbiology laboratory of the hospital. HBsAg, anti-HBs, anti-HCV, and anti-HIV titers were tested using the chemiluminescence enzyme immunoassay method (Architect, Abbott Laboratories, USA).

Results: HBsAg and anti-HBs levels were tested in 35,295 pregnant women aged 18-45 years. The HBsAg and anti-HBs levels were positive in 425 (1.2%) and 9583 (27.7%) patients, respectively. From 2013 to 2016, the HBV carrier rates have continuously decreased from 1.4% to 0.8%, whereas the anti-HBs positivity has increased from 25.4% to 30.2%. Anti-HCV was detected in 6 of the 9709 (0.06%) patients. All the 7113 pregnant women screened for HIV showed negative results.

Conclusion: Hepatitis B carrier rates among pregnant women gradually decreased with a simultaneous increase in the immunity rates. HCV seroprevalence was low and HIV positivity was not encountered in the study population.

Keywords: Hepatitis B, hepatitis C, HIV, pregnancy, seroprevalence

INTRODUCTION

Hepatitis B virus (HBV) may cause chronic viral hepatitis, liver cirrhosis, and even hepatocellular carcinoma (HCC) in the long term. HBV is responsible for approximately one million deaths per year. It is estimated that 257 million people are chronically infected with HBV. In 2015, 887,000 people died due to complications of HBV infection, cirrhosis, and liver cancer, which could be prevented by vaccination. The World Health Organization has declared HBV as the second important carcinogen after tobacco and has recommended routine newborn vaccinations (1,2). HBV can be transmitted parenterally (percutaneous contact with infected blood or body fluids), horizontally (close contact without intercourse), sexually, and perinatally or vertically (from mother to child). In highly endemic areas, perinatal transmission is one of the most significant ways of HBV spread. Intrauterine infection of the fetus is of low possibility due to the placental barrier. The transmission of HBV usually occurs during or after labor through the contact of the epithelia and mucosal surfaces with infected maternal fluids, swallowing of maternal blood while passing through the vaginal channel, contact with the mother's blood during cesarean section, or via a damaged placenta (3). When the mother is acutely infected, the infection risk for the infant is 10% in the first 2 trimesters and 80-90% during the last trimester and the prenatal period (4). About 50% of pregnant women with chronic HBV infection infect their infants in the perinatal period. Maternal HBeAg positivity and HBV DNA levels are important in perinatal transmission. The risk of HBV transmission from an HBeAg-positive mother is 70-90%, where-

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as this rate is around 10-40% for the HBeAg-negative mother. As the viral load increases, the transmission rate of HBV also increases (5,6).

Chronic HBV infection risk is inversely proportional to maternal age. The rate of chronic HBV infection is higher than 90% in newborns, 20-30% in children exposed to HBV at the age of 1-5, and less than 5% in adults (7). Accordingly, it was reported that before the standardization of vaccination and hepatitis B immune globulin (HBIG) application, 70-90% of infants of mothers with chronic HBV infection would become chronically infected in the following 6 months. In pregnant women infected with HBV, the superiority of vaginal birth over cesarean section or vice versa has not been demonstrated. Since it does not prevent intrauterine transmission, cesarean section should be preferred only in the presence of obstetric indications.

A protection rate of 90% is possible via immunization (8). Some infants may be affected (8-30%) despite the administration of vaccination with HBIG. High levels of maternal viremia, HBV infection during intrauterine period, and inactivity of HBIG due to the mutation of the gene coding HBsAg have been suggested as reasons (3). HBIG and HBV vaccines should be administered to infants of mothers infected by HBV in the first 12 hours after labor; the vaccination should be applied in three doses within the first year (at birth, fourth week, and at 6 months). In one study, maternal HBIG application to HBsAg and HBeAg positive pregnant women in the third trimester was shown to be advantageous and effective in preventing intrauterine fetal HBV infection and contributed to the enhancement of immune responses of the infants (3,9). Although routine vaccination is not suggested during pregnancy, there is no negative impact of HBV vaccine on the mother or the fetus (10). The Turkish Ministry of Health applies HBV vaccination routinely to all newborns since 1998.

Hepatitis C virus (HCV) is another important hepatitis agent that may cause chronic viral hepatitis, liver cirrhosis, and HCC (5,6). It is estimated that there are 170 million HCV-positive people in the world, and the HCV prevalence rates are between 1-8% among pregnant women (6). Although at a lower rate compared to HBV and HIV, HCV infection can also be transmitted perinatally. Perinatal transmission is the major source of pediatric HCV infection. Thus, nearly 7000 new HCV cases are born from infected mothers each year (11). Perinatal transmission rates are reported as 4-7%, and transmission occurs if HCV-RNA is positive in maternal blood during labor (5,6). The transmission risk is closely related to the viral load. In cases where the viral load is higher than 10^6 copies/mL, the risk increases up to 36% (12). Other factors increasing transmission risk are the presence of HIV co-infection, intravenous drug use, prolonged membrane rupture, elongated labor action, exposure of the fetus to maternal blood or secretions, and invasive internal fetal monitoring (5,6). Cesarean section and breastfeeding do not increase the risk of transmission if the mother is only HCV positive but increase the risk for HIV co-infected women (5).

Some studies have reported perinatal complications in anti-HCV positive pregnant women, such as early membrane rupture, preterm delivery, placental abruption, low birth weight, low Apgar score, congenital malformation, neonatal jaundice, and perinatal mortality; however, these were not confirmed by other studies (5,6,13-15).

Human immunodeficiency virus (HIV) is another important virus that may be vertically, perinatally, and postnatally transmitted from the mother to the fetus at a total rate of 35-40% (16).

Vertical transmission of HBV, HCV, and HIV infections are important public health problems. Many studies have been conducted on the seroprevalence of these infections in pregnancy (Table 1) (1,7,17-26). The aim of this study was to evaluate HBV, HCV, and HIV seroprevalence in pregnant women and to compare the results with previous data from Turkey.

MATERIALS AND METHODS

This retrospective study was conducted between January 2013 and December 2016 on pregnant women who presented to a regional maternity hospital in Eastern Anatolia for antenatal follow-up or delivery. Ethical approval was obtained from the Ethics committee of the Erzurum Regional Training and Research Hospital in 2013. Data were collected from the hospital electronic health records and patient files. Blood samples were tested at the microbiology laboratory of the hospital. HBsAg, anti-HBs, anti-HCV, anti-HIV levels were determined using the chemiluminescence enzyme immunoassay method (Architect, Abbott Laboratories, USA). Qualitative anti-HCV and anti-HIV results that were examined during this period were also included in the study. The results were evaluated in terms of the number of cases and percentages. Due to the retrospective nature of the study, informed consent forms could not be obtained.

Table 1. Previous studies on HBV, HCV, and HIV seroprevalences among pregnant women in Turkey*

Study and Year	Region	HBsAg n (%)	Anti-HBs (%)	Anti-HCV n (%)	Anti-HIV n (%)
1987-1998 (17)	Nationwide	20 472 (4.4)	23%	-	-
1998-2012 (17)	Nationwide	41 107 (4.3)	-	-	-
Parlak et al. 1994 (20)	Erzurum	171 (2.3)	31.5%	-	-
Kadanali et al. 1997 (21)	Erzurum	282 (6.3)	-	-	-
Tekay et al. 2006 (22)	Sanliurfa	2335 (5.1)	-	2066 (0.9)	2548 (0.1)
Madendag et al. 2007 (18)	Ankara	90 351 (2.1)	-	60 729 (0.2)	6056(0.004)
Dundar et al. 2009 (23)	Istanbul	3503 (2.2)	-	3496 (0.1)	3496 (0)
Cicek et al. 2012 (24)	Sanlıurfa	56 275 (3.5)	25%	13719 (0.8)	-
Ozlu et al. 2012 (19)	Bolu	1653 (1.8)	-	653 (0.5)	653 (0)
Kolgelier et al. 2012 (25)	Adiyaman	9420 (4.7)	38.4%	0.2%	-
Furuncuoglu et al. 2015 (26)	Istanbul	7605 (1.5)	11.5%	-	-
Tanriverdi EC, 2016	Erzurum	35 265 (1.2)	9583/ 34 489 (27.7)	6/9709 (0.06)	0/7113 (0)

*Adapted from reference number 17

Table 2. HBsAg, anti-HBs, anti-HCV, and anti-HIV positivities of pregnant women

Year	HBsAg n (%)	Anti-HBs n (%)	Anti-HCV n (%)	Anti-HIV n (%)
2013	128/9191 (1.4%)	2150/8465 (25.4%)	1/3412 (0.03%)	0/1389 (0)
2014	114/8692 (1.3%)	2281/8641 (26.4%)	1/3163 (0.03%)	0/2802 (0)
2015	106/8696 (1.2%)	2519/8667 (29.0%)	3/1516 (0.19%)	0/1401 (0)
2016	76/8716 (0.87%)	2633/8716 (30.2%)	1/1618 (0.06%)	0/1521 (0)
Total	425/35.295 (1.2%)	9583/34.489 (27.7%)	6/9709 (0.06%)	0/7113 (0)

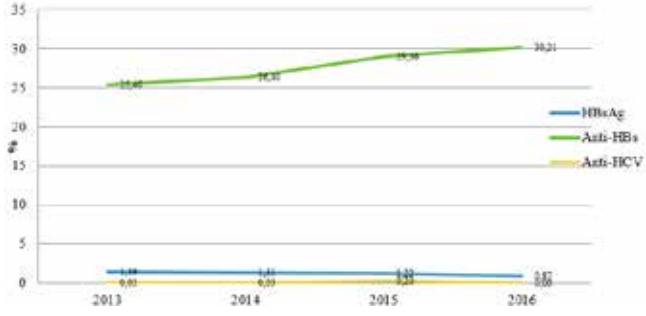

Figure 1. HBsAg, anti-HBs, anti-HCV, and anti-HIV positivities of pregnant women

Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences version 17.0 (SPSS Inc.; Chicago, IL, USA) software. Results of the analyses were described in the form of frequencies and percentages.

RESULTS

A total of 35,295 pregnant women were included in this study. The mean age of the patients was 25.35±5.18 years. The HBsAg, anti-HBs, anti-HIV, and anti-HCV results were evaluated separately for each year (Table 2, Figure 1). HBsAg and anti-HBs levels were determined as 1.2% (425/35295) and 27.7% (9583/34.483), respectively. From 2013 to 2016, the rate of HBsAg decreased from 1.4% to 0.87%, and anti-HBs levels increased from 25.4% to 30.2%.

Anti-HCV was detected in 6 of the 9,709 patients tested (0.06%). All the 7,113 women tested for HIV showed negative results, and none had co-infections. HCV and HIV tests were not screened in all patients because seroprevalences of HCV and HIV are very low among people living in Turkey. Occasionally, kits were not available in the hospital laboratory. Another important cause was the different test-ordering behaviors of doctors.

DISCUSSION

Turkey is considered an intermediate country according to the HBV prevalence classification (7). In Turkey, 4-10% of the population (3-5 million) is considered HBV carriers. The mean HBsAg and anti-HBs seropositivity

rates among pregnant women in Turkey were reported as 4.4% (range: 1.2-12.3%) and 23% (range: 3.7-41.1%), respectively (7,17).

In previous studies in Eastern Turkey, Parlak et al. (20) and Kadanalı et al. (21) reported HBsAg positivity rates in pregnant women as 2.3% and 6.3%, respectively. In our study, among 35,265 pregnant women, the total HBsAg and anti-HBs positivity rates were 1.2% and 27.7%, respectively. From 2013 to 2016, the HBsAg positivity rate decreased from 1.4% to 0.87% and that of anti-HBs increased from 25.4% to 30.2%. In other regions of Turkey, HBsAg positivity rates in pregnant women were reported between 1.5-5.1% (18,19,23-26). In a nationwide study conducted on 20,472 persons between 1987 and 1998, the HBsAg and antiHBs positivity were reported as 4.4% and 23%, respectively. In another nationwide study performed between 1998 and 2012, HBsAg was positive in 4.3% of the 41,107 persons tested (17).

When compared with the results from other studies, the antibody values were higher and antigen levels were lower than the national and previous regional values. This situation shows the success of HBV vaccination in this region. When the results of our study were compared with the general population in this region, it was noted that the HBV carrier rate in pregnancy is lower and antibody levels are higher. Furuncuoglu et al. (26) reported a similar increase in the rate of anti-HBs and decrease in the rate of HBsAg in their study conducted on pregnant women over a 20-year period. Similarly, Guçlu et al. (28) reported a decrease in the HBsAg positivity after the introduction of the national HBV vaccination program.

Lowering the rate of HBsAg to 1.2% in the last 20 years is a remarkable success in terms of controlling HBV infection. The low carrier rate encountered in Turkey is a pleasant consequence of the vaccinations conducted by the Ministry of Health, improvement of public hygiene, and awareness raised by organizations, such as the Viral Hepatitis Control Society and the Turkish Liver Research Society.

We contemplate that, the low level of HBV carriage among pregnant women in the present study region is a milestone for the prevention of the infection occurrence in the next generations. Besides, our results indicate the progress in the control of HBV infection. Since it includes the most recent data and due to the large sample size, our study reflects the latest condition. This seems promising, but in terms of immunization, there is still a way to go.

Hepatitis B virus seroprevalences in pregnancy similar to our results have been reported from other countries. The HBsAg seropositivity was found 1.9% in Bali, 1% in northern Italy, 1.7% in Panama, 4.6% in Niger, and 2.8% in Greece (29-33).

In Turkey, the anti-HCV positivity rate was reported as 0.3% (range 0-1.5%) among blood donors and the general population and as 0-2.04% among pregnant women (27).

Erol et al. (34) detected an anti-HCV positivity of 1.12% in 26,577 blood donors. In the current study, only 6 HCV positive results were found out of 9,709 (0.06%) pregnant women, and this value is low when compared to previous regional and national data .

The prevention of HIV transmission from the mother to the newborn is possible with screening and antiviral treatment of the mother during pregnancy and prophylaxis administered to the newborn after delivery. Particularly, pregnant women in risk groups should be screened in HIV-endemic areas (16). In this study, all 7,113 patients examined for anti-HIV showed negative results. Studies investigating HIV antibody among pregnant women in Turkey generally did not find any positive cases, and the positivity detected in a few patients was determined to be false positive after subsequent tests. As in our study, also Özlü et al. (18) and Dündar et al. (29) could not detect any HIV positivity using the enzymelinked immunosorbent assay (ELISA) test, and the only studies that have reported positivity were those by Madendağ et al. (18) with 0.0004% positivity rate in 60,562 pregnant women and Tekay et al. (22) with 0.1% seropositivity in 2,548 pregnant women. In summary, the absence of HIV positive patients in our sample was consistent with literature.

In this study, HCV and HIV positive results were extremely low. The results of the study showed that HBV carriage is decreasing, and immunity is increasing in the study region.

Limitations of the study

We could not document the age groups of the mothers and the perinatal complications in this study. Besides, not all the samples could be tested for antiHCV and HIV.

In conclusion, hepatitis B virus carriers among pregnant women in Eastern Turkey are gradually decreasing, and immunity is increasing. HCV seroprevalence is low, and HIV positivity is not encountered in the study region. To

prevent perinatal infections and protect the newborn from the long-term effects, all pregnant women should be screened for HBV, HCV, and HIV in addition to risk group screening.

Ethics Committee Approval: Ethics committee approval was received for this study from Ethics Committee of the Erzurum Regional Training and Research Hospital.

Informed Consent: N/A.

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