



Incidence and Trends of Hepatitis B, Hepatitis C, and HIV among Pregnant Women: A Retrospective Cross-Sectional Study

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ABSTRACT

Objective: This retrospective cross-sectional study aimed to investigate the incidence and trends of hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and rates of Hepatitis B surface antibody (anti-HBs) positivity among pregnant women attending an outpatient obstetrics clinic.

Methods: Over a four-year period, data from 11,641 antenatal records were analyzed to determine the incidence and trends of anti-HBs, HBV, HCV, and HIV among pregnant women. Screening for anti-HBs, HBsAg, anti-HCV, and anti-HIV antibodies were categorized as positive or negative. People with multiple pregnancies were only counted once for their first positive. Descriptive statistics, chi-square tests for trend analysis, and Poisson distribution were utilized for data analysis.

Results: The study revealed varying incidence rates of HBsAg, anti-HCV, and anti-HIV between 1.6-9.2%, 0.2-1.2%, and 0-0.6%, respectively. Absence of HIV cases in 2020 and 2021 changed in 2022 with a 0.2% increase, escalating to 0.6% in 2023. The analysis of anti-HBs levels and HBsAg positivity supported the importance of maternal immunity and HBV infection.

Conclusion: Routine screening for HBV, HCV, and HIV is crucial during pregnancy to prevent vertical transmission and improve maternal and infant health outcomes. Understanding the importance of maternal immunity and implementing targeted interventions and public health strategies to reduce transmission rates among pregnant women is essential for achieving this goal.

INTRODUCTION

Chronic infections of hepatitis B virus (HBV) and hepatitis C virus (HCV) affect approximately 296 million (3.8%) and 58 million (0.8%) individuals, respectively, and making them leading causes of cirrhosis and liver cancer on a global scale.^[1] Concurrently, the estimated number of people living with human immunodeficiency virus (HIV) reached 39.0 million by the end of 2022, with a rise attributed to improved treatment outcomes and continued new HIV infections.^[2] In 2019, over 3 million new cases of HBV and HCV infections were reported globally, resulting in a mortality rate exceeding 1.1 million due to these pathogens.^[3] Likewise, despite the availability of antiretroviral therapy (ART), the year 2022 witnessed a total of 630,000 deaths associated with acquired immunodeficiency syndrome (AIDS) caused by HIV.^[2] Besides, each of

these three viruses is transmissible via sexual intercourse, parenteral pathways like blood transfusions or needle sharing, and vertical transmission from an infected mother to her baby during gestation or delivery.

The prevalence of hepatitis B, hepatitis C, and HIV varies among pregnant women globally, ranging from 1% to 5% for hepatitis B and C and up to 30% for HIV in regions such as sub-Saharan Africa.^[4,5] The impact of HBV infection on the risk of obstetric complications is still unclear. However, research findings suggest that HBV infection may pose a risk of preterm birth, gestational diabetes, and antepartum hemorrhage.^[6,7] On the other hand, it is evident that pregnancies affected by HCV are susceptible to premature rupture of membranes, preterm birth, low birth weight, and gestational diabetes in cases of excessive maternal weight gain.^[8,9] In addition to the risks of adverse events associated with HIV/AIDS during pregnancy, po-

tential side effects of ART, including psychiatric disorders, liver and kidney issues, gestational diabetes, anemia, small-for-gestational-age infants, and premature deliveries, must also be considered.^[10]

Of the trio of viral infections discussed, only HCV is curable, however, it is crucial to promptly identify pregnant women with viral infections to initiate interventions that can prevent mother-to-child transmission.^[11] This study aims to estimate the incidences of HBV, HCV, and HIV among pregnant women and assess the rates of Hepatitis B surface antibody (anti-HBs) positivity as a secondary objective, contributing to the understanding of viral infections during pregnancy.

MATERIALS AND METHODS

This study was designed as a population-centric, retrospective, and cross-sectional analysis. The study was conducted at an outpatient obstetrics clinic within a tertiary health care facility, with information gathered from antenatal records dating from January 2020 to January 2024. The results of the screenings for anti-HBs, HBsAg, anti-HCV, and anti-HIV antibodies were determined as either positive or negative and documented accordingly. A positive result was determined when the concentration of anti-HBs antibodies reached or exceeded 10 mIU/mL.^[12] Owing to our access to personal data within the system, individuals experiencing multiple pregnancies over the years were counted only once for their initial application positivity, without duplicating their subsequent pregnancy outcomes. There were no further criteria for exclusion. Maternal sociodemographic information such as maternal age, parity, education level, marital status, and tobacco or alcohol consumption during pregnancy was determined from the same antenatal records.

This study was approved by the Local Ethics Committee on May 13, 2020, under Decision No. 2020/154/177/38 and conducted according to the Declaration of Helsinki. Informed consent was not applicable as this was a retrospective analysis of existing data.

In order to ascertain the incidences of hepatitis B and hepatitis C among pregnant women, the number of hepatitis B or hepatitis C cases was divided by the total number of pregnancies for that year and subsequently multiplied by 100. An identical approach was implemented in the incidence of HIV/AIDS.

Table 1. Characteristics of pregnant women

	n (%)
Maternal age	28.72±5.98 (15-50)*
Parity	1.20±1.08 (0-6)*
Educational level, n (%)	
Primary school	4287 (36.8%)
Lower secondary school	5079 (43.6%)
Upper secondary school	2117 (18.2%)
Higher education	158 (1.4%)
Marital status, n (%)	
Married	10128 (87%)
Single	1513 (13%)

*Values as mean± standard deviation(minimum-maximum).

All statistical analyses were conducted using IBM® SPSS® software version 24 (IBM SPSS Armonk, NY). Descriptive statistics were used to summarize continuous variables, presented as mean with standard deviation, minimum, and maximum values, and categorical variables, reported as counts with percentages. Chi-square for trend tests were used to examine trends in HBV, HCV, and HIV across the study period. Given the rarity of infection among the pregnant women in our study cohort, we adopted a Poisson distribution for our data analysis.

RESULTS

A total of 11641 pregnant women were included in for the study. 3.8% of the pregnant women were smokers (n=442) and 0.5% of expectant mothers(n=58) were regularly consuming alcohol during their gestational phase. The characteristics of the women are summarized in Table 1.

The mean age of the pregnant women on the blood sample day was 28.72±5.98. The mean parity was 1.20±1.08, and 2037 (17.5%) women were nulliparous.

The graph in Figure 1 illustrates the distribution of anti-HCV, HBsAg, and anti-HIV positivity across different years. The information depicted in Figure 2 includes data on both anti-HBs levels and the annual birth counts. Table 2 has further revealed the counts and ratios of HBsAg and anti-HBs values across the years. Two patients in 2023 were found to be positive for anti-HCV, HBsAg, and anti-

Table 2. HBsAg and anti-HBs values across the years

HBsAg	Anti-HBs	2020	2021	2022	2023
+	+	0	0	0	2 (0.05%)
+	-	24 (1.6%)	365 (9.2%)	223 (5.4%)	70 (1.7%)
-	-	719 (47.1%)	1582 (39.9%)	1694 (41%)	1632 (40.6%)
-	+	782 (51.3%)	2017 (50.9%)	2213 (53.6%)	2320 (57.7%)

Values as counts and percentages.

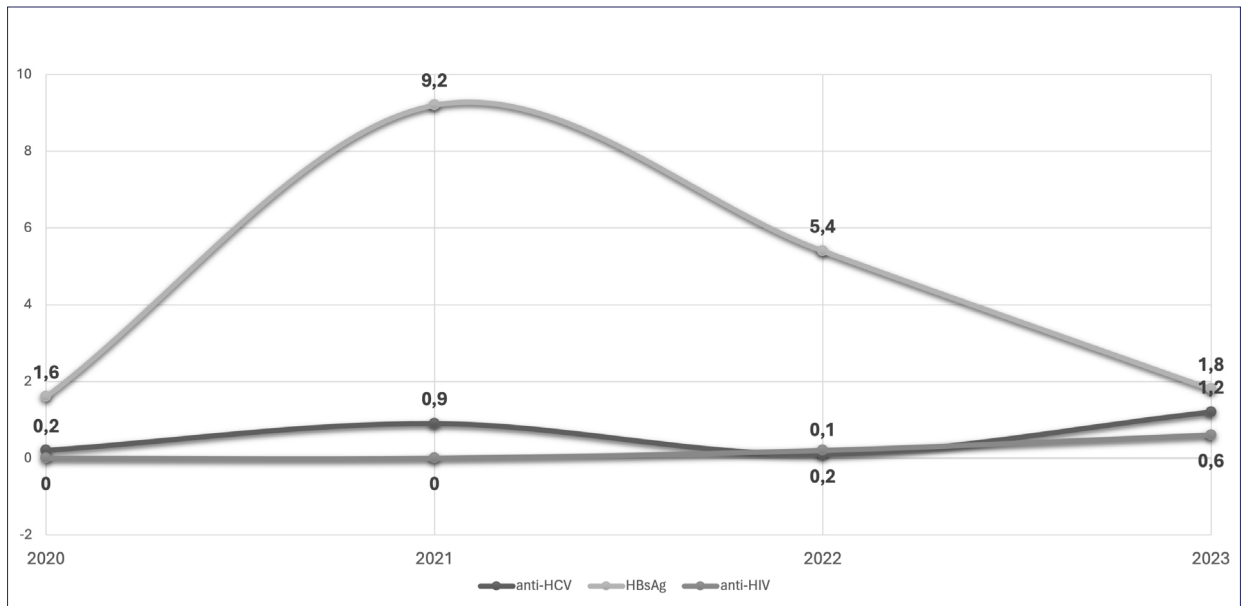


Figure 1. The incidences of HBV, HCV, and HIV among pregnant women throughout the years.

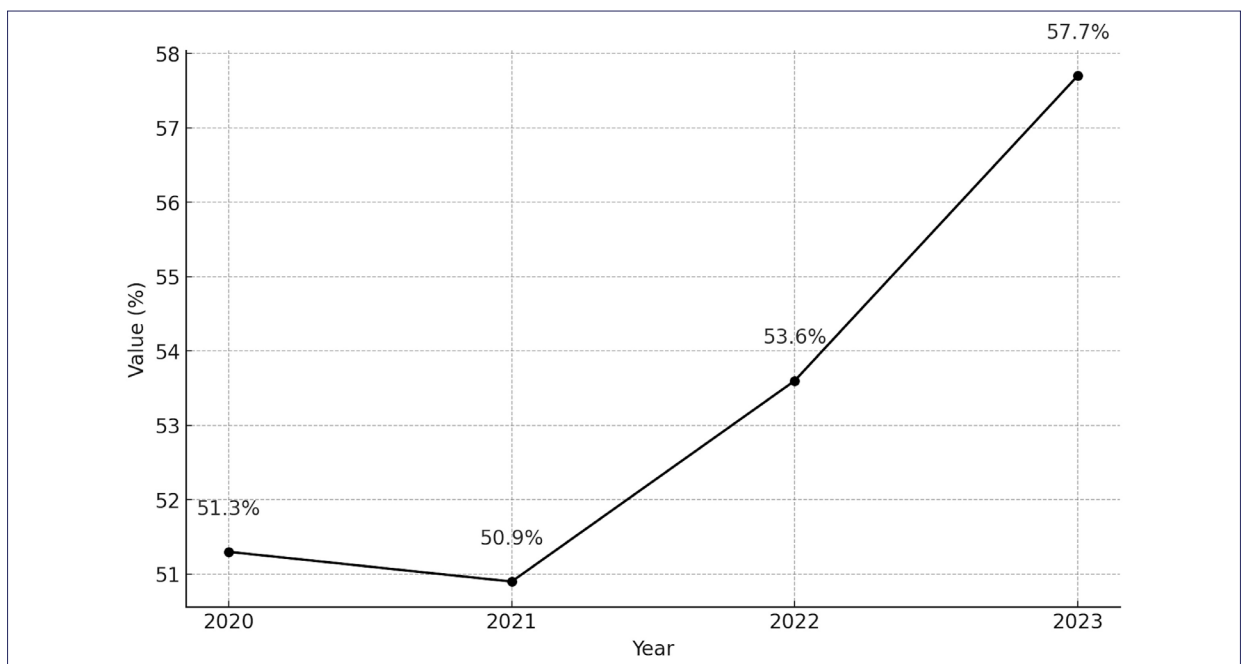


Figure 2. Annual anti-HBs positivity rates.

HIV. With the exception of these patients, every patient exhibited positivity that was exclusive to a single group.

DISCUSSION

In our study, we analyzed the levels of HBsAg, anti-HCV, anti-HIV, and anti-HBs in 11641 pregnant patients over a four-year period. During this time, the incidence of HBsAg, anti-HCV, and anti-HIV varied between 1.6-9.2%, 0.2-1.2%, and 0-0.6%, respectively. Anti-Hbs levels showed

fluctuations within the range of 50.9% to 57.7%. The plots of the anti-HBs and HBsAg manifested as symmetrical reflections of one another. In 2020 and 2021, no cases of HIV were reported. However, in 2022, the incidence increased to 0.2%, and by 2023, it had risen to 0.6%.

One possible explanation to interpret the absence of HIV cases, it is essential to recognize the COVID-19 pandemic that was prevalent throughout the entirety of 2020.^[13] During this period, it was strongly advised by the author-

ities that individuals refrain from visiting hospitals unless it is necessary or in the event of a medical emergency. Due to the three-tiered healthcare framework in our nation, pregnant women predominantly received healthcare at primary health centers during the specified period. On the other hand, while the overall incidence of HIV/AIDS among pregnant women remains relatively low, the increase in cases in 2022 and 2023 appears to be in line with the rise of incidence observed all over the world.^[14] The absence of reported HIV cases during a particular timeframe may reflect challenges in healthcare access, reporting practices, and stigma associated with the disease. Therefore, continued efforts are needed to ensure accurate tracking and support for individuals affected by HIV/AIDS.

Another aspect to consider in the evaluation is, in comparison to global estimates, the incidence rates of HBV and HCV infections among pregnant women in our study fall within the reported range, with HBV ranging from 1.6% to 9.2% and HCV ranging from 0.2% to 1.2%.^[15] However, our study rates are higher when compared to research studies exclusively conducted in Turkey.^[16,17] These rates are consistent with previous studies highlighting the endemic nature of these viral infections and underscoring the importance of antenatal screening and interventions to prevent vertical transmission.^[18]

Moreover, our findings about the symmetrical reflections noted in the plots of anti-HBs and HBsAg levels among pregnant women support the relationship between maternal immunity and viral replication and indicating the importance of antibodies in protecting against HBV infection.^[19] While we may be unable to definitively identify whether anti-Hbs positivity arises from vaccination or a past infection, it nevertheless emphasizes the critical importance of the vaccine.^[20,21]

Despite the valuable insights gained from our study on the incidence of HBV, HCV, and HIV/AIDS among pregnant women, several limitations should be acknowledged. First, the retrospective nature of our study may have introduced bias or limitations in data collection. There may have been inconsistencies or missing data in the antenatal records, potentially affecting the accuracy and completeness of our findings. Additionally, the reliance on electronic health records for data extraction may have limited our ability to capture all relevant variables or information that could have provided further context for the observed trends in viral infection prevalence.

Second, our analysis focused on the incidence of HBV, HCV, and HIV/AIDS among pregnant women without exploring other potential factors that could influence viral transmission or pregnancy outcomes. Factors such as viral load, mode of transmission, maternal immune status, and treatment history were not included in our analysis, limiting the depth of our findings and the ability to draw more nuanced conclusions about the impact of these infections on maternal and infant health.

Despite these limitations, our study offers valuable insights into the incidence of viral infections among pregnant women and highlights the importance of ongoing surveillance, screening, and intervention efforts to improve maternal and infant health outcomes. Future research addressing these limitations could further enhance our understanding of the epidemiology and impact of HBV, HCV, and HIV/AIDS in pregnancy.

CONCLUSION

In conclusion, the results of this study provide valuable insights into the incidence of hepatitis B, hepatitis C, and HIV/AIDS among pregnant women, highlighting the importance of antenatal screening, vaccination, and education for high-risk populations. Further research can explore the impact of sociodemographic factors on the prevalence of these viral infections among pregnant women, as well as the effectiveness of targeted interventions to reduce transmission rates.

Ethics Committee Approval

The study was approved by the Local Ethics Committee of Kartal DR. Lütfi Kırdar Training and Research Hospital (Date: 13.05.2020, Decision No: 2020/154/177/38).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: K.T., B.K.; Design: K.T., B.K.; Supervision: K.T., B.K.; Data: B.K.; Analysis: B.K.; Literature search: B.K.; Writing: B.K.; Critical revision: K.T.

Conflict of Interest

None declared.

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Gebelerde Hepatit B, Hepatit C ve HIV'in Görülme Sıklığı ve Eğilimleri: Retrospektif Kesitsel Bir Çalışma

Amaç: Bu retrospektif kesitsel çalışma, bir poliklinikte periyodik olarak yapılan taramalara katılan gebeler arasında hepatit B virüsü (HBV), hepatit C virüsü (HCV), insan immün yetmezlik virüsü (HIV) ve Hepatit B yüzey antikoru (anti-HBs) pozitiflik oranlarını araştırmayı amaçlamıştır.

Gereç ve Yöntem: Dört yıllık bir dönemde, 11,641 gebelik kaydı verileri analiz edilerek anti-HBs, HBV, HCV ve HIV insidans ve trendleri belirlenmiştir. Anti-HBs, HBsAg, anti-HCV ve anti-HIV antikorları için taramalar pozitif veya negatif olarak kategorize edilmiştir. Birden fazla gebeliği olan kişilerde sadece ilk başvurularındaki gebelikteki pozitiflikler sayılmıştır. Veri analizi için tanımlayıcı istatistikler, Poisson dağılımı ve trend analizi için ki-kare testleri kullanılmıştır.

Bulgular: Çalışma, HBsAg, anti-HCV ve anti-HIV insidans oranlarının sırasıyla %1.6-9.2, %0.2-1.2 ve %0-0.6 arasında değiştiğini ortaya koymuştur. 2020 ve 2021 yıllarında HIV vakası yokken, 2022 yılında %0.2'lik bir artışla göstermiş ve 2023'te %0.6'ya yükselmiştir. Anti-HBs düzeyleri ve HBsAg pozitifliği analizi, HBV enfeksiyonunda maternal bağışıklığın önemini göstermektedir.

Sonuç: Hamilelik sırasında HBV, HCV ve HIV için rutin tarama yapılması, anneden bebeğe bulaşmayı önlemek, anne ve bebek sağlık sonuçlarını iyileştirmek için hayati öneme sahiptir. Maternal bağışıklığın önemini anlamak ve gebelerdeki bulaşma oranlarını azaltmak için hedefe yönelik müdahaleler ve kamu sağlığı stratejileri uygulamak bu amaca ulaşmak için esastır.

Anahtar Sözcükler: AIDS; gebelik; HBV; HCV; HIV; insidans.