

Investigation of HBV, HCV, and HIV Seropositivity in Healthcare Workers of Reproductive Age

 Hulya Aladag¹

¹ Department of Obstetrics and Gynecology, Malatya Turgut Özal University Faculty of Medicine, , Malatya, Turkey

Abstract

Background: Hepatitis B virus (HBV), hepatitis C virus (HCV), and Human Immunodeficiency Virus (HIV) infections are health problems that threaten human health. This study aimed to investigate HBV, HCV, and HIV seropositivity in female healthcare workers of childbearing age in our hospital.

Materials and Methods: 1224 women working in our hospital, who were of childbearing age, were included in the study. The HBsAg, Anti-HBc total, Anti-HBs, Anti-HCV, and anti-HIV results of the patients were analyzed using the hospital database.

Results: Seven (0.5%) reproductive-age female healthcare workers were positive for HBsAg. While anti-HB positivity was detected in 1128 (93.6%) of 1224 healthcare workers, anti-HBs and anti-HBc were positive in 80 (6.53%) patients. Both anti-HBs and anti-HBc were negative in 16 (1.3%) subjects (neither vaccinated nor exposed to HBV).

Conclusion: Healthcare workers are at high risk for viral hepatitis and other infectious diseases. The fact that the frequency of HBV, HCV, and HIV among healthcare professionals of reproductive age is relatively low in our region shows that the training for healthcare professionals has been quite successful in recent years, both in our country and in our area.

Due to the high contagiousness of viral hepatitis B in our country, not only healthcare professionals of reproductive age but all healthcare personnel should be meticulously vaccinated. It is essential to implement standard infection control programs for HBV, HCV, and HIV and to increase compliance with national and international programs.

Keywords: Seroprevalence, healthcare professionals, hepatitis B virus, hepatitis C virus, HIV

Introduction

Blood-borne diseases are among the most common risks that healthcare workers are exposed to.¹ According to the World Health Organization (WHO) data, more than 80 million healthcare workers worldwide are infected with contaminated medical devices.² Infections caused by hepatitis B (HBV) and hepatitis C (HCV) viruses and human immunodeficiency virus (HIV) have become significant health problems due to the increase in the number of patients all over the world. Hepatitis B virus (HBV) infection can lead to chronic hepatitis, cirrhosis, and hepatocellular carcinoma over time, which may threaten life.³⁻⁴⁻⁵ The Prevalence of HBV is 3.5-4% in the general population. It has been reported that this rate is 1.5-2 times higher in healthcare personnel.⁴ The prevalence of HCV is lower than HBV (0.2%-2%). However, it causes chronic hepatitis and cirrhosis more frequently compared to HBV. It is known that approximately 71 million people in the

world are infected with HCV.⁶ The frequency of HCV in Turkey varies between 0.3-1.8% in the general population.⁷ Health workers may become infected with this virus during interventional procedures, surgical interventions, and dressings.⁸ It is essential to investigate risky diseases such as HBV, HCV, and HIV in female healthcare workers. These infections pose a danger to both the mother and the fetus and negatively affect both health. Our research is significant because it is the first study conducted on female workers of reproductive age in our country.

This study aimed to investigate HBV, HCV, and HIV seropositivity in female healthcare workers of childbearing age working in our hospital.

Material and Method

The study included 1224 female health personnel of reproductive age, aged between 19-50 years, working in the Education and Research Hospital of our University between

January 01, 2020, and December 31, 2021. Ninety-three people whose data could not be reached or whose data were missing were excluded from the study. Ethics committee approval was obtained for this study. The international Declaration of Helsinki carried out the study. Demographic information about the patients, their departments, and their occupations were recorded in the forms. They were grouped according to their occupations, age groups, and years of employment. Obtained laboratory results were compared with these groups. The patients were divided into groups according to their professions as doctors, nurses, laboratory workers, technicians, and other staff of our hospital. In terms of working time, they were divided into groups of one, five, ten years, and more than ten years.

Laboratory Analysis

Serum samples HBsAg, anti-HBc total, anti-HBs, anti-HCV, and anti-HIV were measured by the ELISA method based on chemiluminescence in an E170 modular (Roche, USA) device. The examinations were carried out by the manufacturer's instructions. Anti-HCV was studied with third-generation testing systems (Abbott AXSYM system, HCV version 3.0, Hepatitis C virus Encoded Antigen (Recombinant HCr43, c200, c100-3, NS5). All samples above the minimum positive value were considered reactive.

Statistical analysis: The obtained data were evaluated using number and percentage calculations. In evaluating HBsAg and Anti-HBs, HCV, and HIV positivity, the age comparison calculated with the odds ratio univariate was compared within itself. The Chi-square test and Fisher exact Chi-square test were applied when necessary. The relationship between age (19-25, 26-35, 36-45 and over 45 years old) and working time (<1, 2-5, 6-10, >11 years) was analyzed by using a multiple logistic regression model. A similar application was made for hepatitis C and HIV, and $p < 0.05$ was considered statistically significant. Statistical Package for the Social Sciences (SPSS) 22.0 (SPSS,

Inc., Chicago, IL, USA) program was used for statistical evaluation of the data.

Results

This study was carried out on 1224 female healthcare workers of reproductive age working in our university's training and research hospital.

The age range of employees of childbearing age is between 19-50, and the average age is 30.02 ± 5.42 years. Of our staff, 211 (17.2%) are doctors, 750 nurses (61.2%), 57 (4.6%) are anesthesia technicians, 20 (1.6%) are in the dialysis unit, 60 are laboratory professionals 4.8), six people (0.49%) were emergency medical technicians, 80 cleaning personnel (6.5%) and 40 people (3.2%) were x-ray technicians.

In our study, we found the HBsAg seroprevalence of women of childbearing age to be 0.57% (Table 1). While 1128 (93.6%) isolated anti-HBs positivity of 1224 healthcare workers were detected, anti-HBs + anti-HBc total positivity was found in 80 (6.64%) individuals (Table 1).

In the comparison made between the task groups, no statistically significant difference was found between the hepatitis B risk and the duty performed by the health personnel in the hospital ($p > 0.05$). The odds ratio value between nurses and doctors was calculated as 2.54.

Isolated anti-HBs were investigated in healthcare professionals, and an average of 93.6% in the whole group, 96.6% in doctors, 93.3% in nurses, 92.9% in anesthesia technicians, 90% in dialysis workers, 86.6% in laboratory workers, 100% in emergency technicians, 75% in cleaning personnel, 87.5% in x-ray technicians. Found. The difference between the groups was not statistically significant ($p > 0.05$). When compared in terms of anti-HBs + anti-HBc total ratios of healthcare workers, it was found 22.5% in cleaning personnel, 10% in laboratory and dialysis technicians, 3.3% in doctors, and 5.4% in nurses, and the difference between the groups was not statistically significant ($p > 0.05$) (Table 1).

Table 1: HBV, HCV, HIV Infection Seropositivity Distribution

Persons	n (%)	HBsAg	Anti-HBs	Anti-HBs+Anti-HBc total	Anti-HCV	Anti-HIV
Doctor	211 (17.2)	0 (0)	204 (96.6)	7 (3.3)	0 (0)	0 (0)
Nurse	750 (61.2)	2 (0.2)	700 (93.3)	41 (5.4)	0 (0)	0 (0)
Anesthesiologist	57 (4.6)	1 (1.7)	53 (92.9)	3 (5.2)	0 (0)	0 (0)
Dialysis	20 (1.6)	0 (0)	18 (90)	2 (10)	0 (0)	0 (0)
Lab technician	60 (4.8)	2 (3.3)	52 (86.6)	6 (10)	1 (0.08)	0 (0)
EMT	6 (0.4)	0 (0)	6 (100)	0 (0)	0 (0)	0 (0)
Cleaning staff	80 (6.5)	2 (2.5)	60 (75)	18 (22.5)	0 (0)	0 (0)
Radiology technician	40 (3.2)	0 (0)	35 (87.5)	3 (7.5)	0 (0)	0 (0)
Total	1224 (100)	7 (0.5)	1128 (93.6)	80 (6.53)	1 (0.08)	0 (0)

n (%): Number (percent) EMT: Emergency medicine technician

Table 2: Working time and HBsAg positivity

Working time Year	Total number n (%)	HBsAg positive n (%)
0-1	150 (12.2)	0 (0)
2-5	280 (22.8)	0 (0)
6-10	600 (49)	1 (0.16)
>10	194 (15.89)	6 (3.0)

Healthcare workers were divided into groups regarding their working time and hepatitis B risk, and the ratios between these groups were compared. The difference was not statistically significant ($p>0.05$). The odds ratio value between the personnel working in the clinic for 11 years or more and the personnel working for one year or less was calculated as 2.45. Since HBsAg positivity was not detected in those who worked less than one year and between 2 and 5 years, it was found positive in 1 (0.01%) of 600 people who worked for 6-10 years, and 6 (0.03%) of 194 people who worked for more than 11 years. The difference was not statistically significant ($p>0.05$). (Table 2). HBsAg was not positive in 80 people aged 19-25 and 280 people aged 26-35. HBsAg was positive in 1 (0.01%) of 544 patients whose age range was 36-45 and 6 (0.02%) of 220 employees aged 45-50 years. When healthcare professionals were divided into age groups and compared within themselves, no statistically significant difference was found between the age groups ($p>0.05$) (Table 3). Health professionals were divided into three groups according to their branches: surgery, internal branches, and personnel working in different hospital units separate from these branches. HBsAg was found positive in 3 (0.06%) of 500 people working in surgical departments, 3 (0.06%) of 450 people working in internal branches, and 1 (0.03%) of 274 people working in other units. In healthcare professionals, these three groups were compared among themselves in terms of hepatitis B risk, and no statistically significant difference was found between the groups ($p>0.05$) (Table 4).

Table 3: Age groups and HBsAg

Age groups	Total n (%)	HBsAg positive n (%)
19-25	180 (14.7)	0 (0)
26-35	280 (22.8)	0 (0)
36-45	544 (44.4)	1 (0.18)
45-50	220 (17.9)	6 (2.7)

Table 4: Department and HBsAg positivity

Department	Total n (%)	HBsAg positive n (%)
Surgical	500 (40.89)	3 (0.60)
Internal	450 (36.7)	3 (0.66)
Other	274 (22.3)	1 (0.36)

Discussion

There have been many studies investigating the seroprevalence of HBsAg all over the world. David et al. found this rate to be 0.1% nine among healthcare workers in the United States and 5% in a study conducted in India.¹⁰ According to studies, the HBV carrier rate in Turkey is between 1.5-7%¹¹⁻¹²⁻¹³. We found the frequency of HBsAg to be 0.5% among healthcare workers of childbearing age in our hospital. This difference can be explained by the fact that healthcare personnel attach importance to preventive measures, investigate the serological indicators of hepatitis B and hepatitis C in patients who will undergo invasive procedures, and the effective use of vaccination. Comparisons were made regarding age groups among healthcare professionals in various centers. Leblebicioglu et al.¹¹ did not find a significant difference, while Özsoy et al.¹⁴ found an important relationship between the 26-35 age group and HBsAg seroprevalence. In our study, healthcare professionals were divided into four groups in terms of age: 19-25, 26-35, 36-45, and 45-50 years old. In our study, no statistically significant difference was found between age groups and HBsAg positivity ($p>0.05$) (Table 3).

In studies investigating a relationship between occupational groups and hepatitis B infection risk in various centers, Köse et al.¹⁵ found no significant difference, while Otkun et al.¹², Ulusoy et al.¹³, Kutlu et al.¹⁶, and Özsoy et al.¹¹ found a meaningful relationship in favor of nurses. Unlike these, Berktaş et al.¹⁷ found this rate high in favor of doctors and attributed this to the fact that most of the nurses included in the study had just started their profession. In our study, no significant difference was found between occupational groups in terms of HBsAg positivity ($p>0.05$) (Table 1). In our research, HBsAg seroprevalence was determined as 0.0% (0) in doctors, 0.2% (2) in nurses, 3.3% (2) in laboratory workers, 2.5% (2) in cleaning personnel, and 1.7% (1) in anesthesia technicians when we divided female healthcare professionals of childbearing age into groups according to their occupations. Found. In the comparison made between occupational groups, no significant relationship was found between the health personnel in terms of hepatitis B risk and the duty they performed in the hospital ($p>0.05$) (Table 1).

However, when the nurses and doctors were compared, the odds ratio value was found to be 2.54. This value shows that the risk of encountering hepatitis B infection among nurses is approximately 2.5 times higher than that of doctors. This may be due to reasons such as nurses' invasive procedures, such as vascular access, and patients' exposure to body benefits and secretions more than doctors. On the other hand, because of their active participation in patient care during their school years, nurses probably encounter HBV earlier than doctors. In our country, unlike western countries, the Prevalence of HCV is lower than HBV. Still, it is essential for both the average

population and healthcare professionals in terms of its more chronicity. In the studies performed, Öksüz et al. 18 found anti-HCV positivity of 0.2%, İnci et al. 19 0.34%, and Aşkar et al. 20 reported it as 0.15%.

In our study, the rate of anti-HCV among healthcare workers of childbearing age was found to be 0.08%. In our study, the frequency of HCV among healthcare workers of childbearing age was found to be positive in only one person (0.008%), and our result was found to be lower than other results in our country. In particular, developments in viral hepatitis C (HCV) have occurred at a dizzying pace. Permanent viral response rates have increased from 15-20% with treatments for one year or a half years in the 2000s to 99-100% with one tablet per day treatment today. The world health cover (WHO) talks about the complete eradication of HCV in the 2030s.

According to WHO's 2022 data, an average of 40 million people worldwide are infected with HIV. The risk of transmission of the human immunodeficiency virus (HIV) is between 0.2-0.5%. 21 In studies reported from our country, anti-HIV positivity was not reported in healthcare personnel. 19-21 In our study, HIV was not detected in any patient among the healthcare professionals of childbearing age, which shows that healthcare professionals have received adequate training and precautions.

Conclusion

As it is known, healthcare workers are at high risk for viral hepatitis and other infectious viral diseases. The fact that the values in our study were lower than the results of previous years in the literature indicates that the training and vaccinations given to female employees of childbearing age are pretty successful. Only people aged 45-50 who worked for more than 11 years had a higher HBsAg value than others due to more prolonged exposure. Due to the high contagiousness of viral hepatitis B in the eastern Anatolia region, where we are located, it is very important to meticulously vaccinate not only healthcare workers of reproductive age, but also all healthcare personnel to implement standard infection control programs for HBV, HCV, and HIV, and to increase compliance with national and international programs.

References

1. Beltrami EM, Williams IT, Shapiro CN, Champerland ME. Risk and management of blood-borne infections in health care workers. *Clin Microbiol Rev.* 2000; 13: 385-407.
2. Shoaei P, Lotfi N, Hassannejad R, Yaran M, Ataei B, Kassaian N, et al. Seroprevalence of Hepatitis C Infection among Laboratory Health Care Workers in Isfahan, Iran. *Int J Prev Med.* 2012; 1: 146-9.
3. Lok ASF. Hepatitis B treatment: What we know now and what remains to be researched. *Hepatology* 2019; 3: 8-19.
4. Mishra D, Singh H, Gogate P, Bhushan P, Singh MK, Srivastav T, et al. Prevalence of incidental and total human immunodeficiency virus, hepatitis B and hepatitis C seropositivity among patients posted for cataract surgery at a tertiary care center in? India. *Indian J Ophthalmol.* 2022; 70: 400-4
5. Global Burden of Disease 2015 HIV Collaborators. Estimates of global, regional, and national incidence, prevalence, and mortality of HIV, 1980-2015: The Global Burden of Disease Study 2015. *Lancet HIV.* 2016; 3: 361-87
6. Tabak F, Yurdaydin C, Kaymakoğlu S et al., and Guidelines Study Group VH. Diagnosis, management and treatment of hepatitis B virus infection: Turkey 2017 Clinical Practice Guidelines. *Turk J Gastroenterol.* 2017; 28:73-83.
7. Özkan H. Epidemiology of chronic hepatitis B in Turkey. *Euroasian j hepatogastroenterol* 2018;8:73
8. Willy ME, Dhillon GL, Loewen NL, Wesley RA, Henderson DK. Adverse exposures and universal precautions practices among a group of highly exposed health professionals. *Infect Control Hosp Epidemiol.* 1990; 11: 351-6.
9. David L ve ark. Viral hepatitis in health care personnel at The John Hopkins Hospital. *Arch Intern Med.* 1993; 153: 1705-12.
10. Acikgoz, A.; Cimrin, D.; Kizildag, S.; Esen, N.; Balci, P.; Sayiner, A.A. Hepatitis A, B and C seropositivity among first-year healthcare students in western Turkey: A seroprevalence study. *BMC Infect. Dis.* 2020, 20, 529
11. Leblebicioğlu H, Günaydin M, Durupınar B. Hastane personelinde hepatit B seroprevalansı. *Mikrobiyol Bül* 1993; 27: 113-8.
12. Otkun M ve ark. Trakya Üniversitesi Eğitim Uygulama ve Araştırma Hastanesi çalışanlarında hepatit B virüs enfeksiyonu prevalansı. *Klimik Derg.* 1994; 7:79-81
13. Ulusoy S, Bilgiç A. Hastane personelinde hepatit B virus serolojik göstergeleri. *İnfek Derg* 1994; 8: 5-6
14. Özsoy MF ve ark. Seroprevalances of hepatitis B and C among health care workers in Turkey. *Journal of Viral Hepatitis*, 2003; 10: 150-156.
15. Köse S ve ark. Yüksek risk grubunda olan sağlık çalışanlarında viral hepatit A, B, C seroprevalansı. *Viral Hepatit Dergisi* 2003; 8: 152-54.
16. Kutlu T ve ark. Sağlık personelinde hepatit B taraması ve aşılama. *Klinik Gelisim* 1995; 8: 3681-84
17. Berktaş M, Dalkılıç AE, Yavuz MT ve ark. Y.Y.Ü. Tıp Fakültesi Araştırma Hastanesi personelinde hepatit B seroprevalansı. *Viral Hepatit Dergisi.* 1995; 2: 87-9
18. Öksüz Ş, Yıldırım M, Özaydın Ç, Şahin İ, Arabacı H, Gemici G. Bir devlet hastanesi çalışanlarında HBV ve HCV seroprevalansının araştırılması. *Ankem Derg.* 2009; 23(1): 30-3.
19. İnci M, Aksebzeci AT, Yağmur G, Kartal B, Emiroğlu M, Erdem Y. Hastane çalışanlarında HBV, HCV ve HIV seropozitifliğinin araştırılması. *Türk Hijyen ve Deneysel Biyoloji Dergisi.* 2009; 66(2): 59-66.
20. Aşkar E. Sağlık Çalışanlarında Hepatit B ve Hepatit C Seroprevalansı [Uzmanlık Tezi]. İstanbul: Şişli Etfal Eğitim ve Araştırma Hastanesi Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji Kliniği, 2006.
21. De Cock KM, Jaffe HW, Curran JW. The evolving epidemiology of HIV/AIDS. *AIDS.* 2012; 26(10): 1205-13.