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Original Article

Seroprevalence of Hepatitis B, C and HIV infection in healthcare personnel in Turkey

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Abstract

Introduction: This study aimed to investigate the seroprevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) infections among health care workers in Zonguldak Gynecology and Pediatrics Hospital.

Methodology: The records of healthcare personnel working in the hospital between 2023 and 2024 were retrospectively analyzed through the hospital information management system (HIMS) and periodic examination forms. Age, gender, job, and test results for Hepatitis B surface antigen (HBsAg), Hepatitis C antibody (anti-HCV), Hepatitis B surface antibody (anti-HBs), and HIV antibodies (anti-HIV/1-2) were all recorded.

Results: A total of 364 healthcare personnel, including 25 doctors, 135 nurses, 14 technicians, 39 cleaning staff, and 151 other personnel, were included in the study. The staff comprised 266 (73%) female and 98 (27%) male workers, and the mean age was 37.69 ± 9.95 years. The HBsAg positivity rate was found to be 0.8%, and the anti-HBs positivity rate was noted to be 82.9%. Significant differences were determined for age, gender, and anti-HBs among occupational groups ($p < 0.001$). The prevalence of anti-HBs was markedly elevated in the group of doctors ($p < 0.001$). The anti-HBs value was statistically significantly different between occupational groups ($p < 0.001$). No staff members tested positive for anti-HCV or anti-HIV.

Conclusions: Differences in infection rates and immunological responses were seen among various occupational groups, emphasizing the necessity for targeted medical attention within this population. Healthcare personnel should have screening for HBV, HCV, and HIV, and individuals susceptible to HBV should receive vaccination.

Key words: Hepatitis B; Hepatitis C; HIV; Health personnel; Seroepidemiologic studies.

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Introduction

Healthcare workers are at risk of acquiring diseases transmitted through patients' blood or bodily fluids during healthcare delivery. Occupational exposure can occur via percutaneous injuries from contaminated instruments or through contact with infected blood or bodily fluids with mucous membranes or non-intact skin.

The risk of infection following a percutaneous injury with a needle used on an infected patient is estimated at 0.3% for Human Immunodeficiency Virus (HIV), 3% for Hepatitis C Virus (HCV), and 6-30% for Hepatitis B Virus (HBV) [1]. The proportions of HCV, HBV, and HIV infections resulting from percutaneous injuries among healthcare workers are reported to be 39%, 37%, and 4.4%, respectively [2].

The World Health Organization (WHO) estimates that approximately 254 million people worldwide are living with chronic HBV and 50 million with chronic HCV infections. In 2022, there were an estimated 1.2 million new HBV infections and one million new HCV infections, with chronic HBV and HCV infections causing 1.3 million deaths annually [3].

Globally, three million of the 35 million healthcare workers are exposed to bloodborne pathogens annually; two million of these exposures involve HBV, 0.9 million involve HCV, and 170.000 involve HIV. These exposures result in approximately 15.000 HCV, 70.000 HBV, and 500 HIV infections annually. Notably, 90% of these infections occur in developing countries [1]. Healthcare workers face a fourfold increased risk of HBV infection compared to the general population [4]. The transmission chain can extend from patients to healthcare workers, then to other patients and workers' close contacts. Due to these risks, it is recommended that healthcare workers be vaccinated against HBV [5]. This study aimed to determine the seroprevalence of HBV, HCV, and HIV among the employees of Zonguldak Gynecology and Pediatrics Hospital in the western region of Turkey, to show immunological and

serological differences between occupational groups, and to ensure vaccination for those not immune to HBV.

Methodology

This study included healthcare workers employed at Zonguldak Gynecology and Pediatrics Hospital who participated in periodic screening examinations during the 2023–2024 period. A total of 364 out of 392 personnel who provided blood samples and completed the personnel screening form were included. The data were retrospectively reviewed using periodic examination forms and records from the Hospital Information Management System (HIMS). Age, gender, Body Mass Index (BMI), and HBsAg, anti-HBs, anti-HCV, and anti-HIV values were recorded. BMI was calculated by dividing body weight (kg) by the square of height (m) (BMI = kg/m^2).

The levels of HBsAg (Hepatitis B surface antigen), anti-HCV (Hepatitis C antibody), and anti-HBs (Hepatitis B surface antibody) in serum were analyzed using Elecsys Anti-HBs II, Elecsys HBsAg II, and Elecsys Anti-HCV II kits, respectively. Anti-HIV/1-2 antibodies were evaluated using the Elecsys HIV combi PT kit (Roche COBAS 6000, Germany), a fourth-generation ELISA test that also detects p24 antigens based on the electrochemiluminescence immunoassay method.

According to the reference ranges specified in the kit instructions, results were considered positive if the HBsAg, anti-HCV, and anti-HIV tests were ≥ 1.0 COI. For the anti-HBs test, values ≥ 10 IU/L were considered positive. Individuals with negative anti-HBs results were included in a vaccination program organized by the hospital's infection control committee. HBsAg positive individuals were followed up at the Infectious Diseases Outpatient Clinic.

Anti-Hbs titre of 10 and above is regarded to be protective. It is reported that anti-HBc positive blood is non-infectious when it contains over 100 mIU/mL of anti-HBV surface antigen (anti-HBs) [6]. The Korean study underlined that long-term boosters are unnecessary for individuals with an anti-HBs titre of 100 or higher [7]. Therefore, in our study, we classified the anti-HBs titres of the patients and assessed them.

The normality of data distribution was assessed using the Kolmogorov-Smirnov test. The Mann-Whitney U test was applied to determine whether there was a significant difference between the two groups for continuous variables. The Kruskal-Wallis test was used for comparisons among more than two groups. Continuous data were presented as medians with interquartile ranges, while categorical variables were expressed as percentages (%n). Chi-square analysis was used for comparing categorical variables. Statistical analyses were performed using SPSS 22.0 (SPSS, Chicago, USA), with a $p < 0.05$ considered statistically significant.

Ethical approval for the study was obtained from the Zonguldak Bülent Ecevit University Non-Interventional Clinical Research Ethics Committee with decision number 2024/11, dated 05/06/2024.

Results

The study included a total of 364 healthcare workers from Zonguldak Gynecology and Pediatrics Hospital who participated in the periodic screening examination in 2024. The cohort consisted of 25 doctors, 135 nurses, 14 technicians, 39 cleaning staff, and 151 others (including secretaries, administrative staff, psychologists, dietitians, security personnel, kitchen staff, and drivers).

Of the participants, 266 (73%) were female, and 98 (27%) were male, with a mean age of 37.69 ± 9.95 years. A statistically significant difference in gender distribution was observed among occupation groups ($p < 0.001$), with the highest percentage of females in the nurse-midwife group (99%) and the highest percentage of males in the technician group (93%). The cleaning staff exhibited the greatest mean age of 43 ± 10.1 years, with a statistically significant difference ($p < 0.001$) when compared to other groups (Table 1).

The groups were evaluated in terms of body mass index (BMI), and the highest mean BMI was observed in the cleaning personnel group (26.7 ± 3.9), and there was a statistically significant difference between the groups ($p = 0.026$) (Table 1).

The HBsAg positivity percentage among all

Table 1. Demographic characteristics, occupation and gender distribution of hospital workers.

	Doctor (n = 25)	Midwife- Nurse (n = 135)	Technician (n = 14)	Cleaning staff (n = 39)	Other (n = 151)	*p*	Total
Gender							
Female	15 (60%)	134 (99.3%)	1 (7.1%)	24 (62%)	92 (61%)	< 0.001	266 (73%)
Male	10 (40%)	1 (0.7%)	13 (93%)	15 (38%)	59 (39%)	< 0.001	98 (27%)
Age	33.7 ± 7.4	34.8 ± 10	40.4 ± 7.3	43 ± 10.1	30.3 ± 9.5	< 0.001	37.69 ± 9.95
BMI	22.8 ± 2.5	24.2 ± 4.6	24 ± 4.16	26.7 ± 3.9	24.4 ± 4	0.026	24.23 ± 4.63

BMI: Body Mass Index.

workers was 0.8%, whereas the anti-HBs positivity rate was 82.9%. HBsAg positivity rates compared among occupation groups, no statistically significant difference was found ($p = 0.891$). The groups were compared in terms of anti-HBs positivity rate, and it was found that the rate was significantly highest in the doctor group ($p < 0.001$). The highest rate of anti-HBs negativity was found in the technician group ($p < 0.001$). When stratified into anti-HBs levels of < 10, 10–100, and > 100, there was a statistically significant difference among groups ($p < 0.001$) (Table 2).

Three of the workers were HBsAg positive and had been previously diagnosed with chronic hepatitis B infection. Two of them were HBeAg (-) chronic HBV infection with regular follow-up, one was not followed up, and was admitted to the infectious diseases outpatient clinic. When the source of transmission of those diagnosed with chronic HBV was questioned, it was learned that one of the workers who was a nurse had a history of percutaneous injury with a needle from a patient diagnosed with hepatitis B in the past years and the other employee who was a security guard was transmitted via vertical route. The other HBsAg positive worker was a secretary, and the source of transmission remained unidentified during investigations.

In terms of anti-HBs, there was one doctor, eight nurses, two technicians, 11 cleaning personnel, and 39 other personnel who tested negative. Hepatitis B vaccination was offered to workers with negative anti-HBs results. Two workers, one technician and one from another staff category, exhibited anti-HBs values below 10 and were not re-vaccinated, since antibodies did not develop despite having received two series of three doses previously.

None of our workers were found to be Anti-HCV and Anti-HIV positive.

Discussion

Globally, there are 136 million workers in the health and social care sectors, approximately 70% of whom are women [8]. Similarly, in this study, 73% of the participants were female.

In this study, significant differences were found between occupational groups in terms of age, gender, and anti-HBs levels. No significant difference was found in terms of HBsAg positivity. It was found that the female-to-male ratio was highest in the midwife-nurse group, the mean age was highest in the cleaning personnel group, the mean BMI was highest in the cleaning personnel group, and the anti-HBs positivity rate was significantly higher in the doctor group. Similar to this study, Bayar *et al.* [9] reported a significant difference between occupational groups in terms of age, gender, anti-HBs, and no significant difference was found in HBsAg positivity rate. Apaydın *et al* [10] also found that mean BMI was significantly higher in the auxiliary health personnel group. Gülaçtı *et al.* [11] found no significant difference between occupational groups in terms of HBsAg positivity, but unlike this study, anti-HBs positivity was found to be significantly higher in midwives-nurses. In this study, the technician group had the highest prevalence of anti-HBs negativity ($p < 0.001$); therefore, they warrant prioritization due to their risk and should be included in the immunization program.

In a study conducted in our country among people over 18 years of age, HBsAg positivity was 4%, anti-HBs positivity was 31.9%, anti-HBs total positivity was 30.6% and anti-HCV positivity was 1%. In Turkey, one in every three people over the age of 18 has been exposed to HBV, and it is thought that there are more than two million adults are HBsAg positive. It was found that only about 12% of these people were aware of the situation [12]. Different studies involving healthcare workers also show that HBV-related test results in healthcare workers are similar to the normal population [13]. In a study comparing HBsAg and anti-HCV seroprevalence rates in healthcare workers with those in blood donors, HBsAg and anti-HCV positivity rates in healthcare workers were 3% and 0.3%, respectively, while these rates in blood donors were 2.1% and 0.4%, respectively. This study showed that the prevalence rates of HBV and HCV were similar to the prevalence rates found in randomized blood donors [13]. Similarly, in the study by Aktaş *et al.* [14], the

Table 2. Seropositivity for hepatitis A, hepatitis B, hepatitis C and HIV infection by occupational groups.

Serology	Doctor (n = 25)	Midwife-Nurse (n = 135)	Technician (n = 14)	Cleaning Staff (n = 39)	Other (n = 151)	*p*	Total
HBsAg (+)	0	1 (0.7%)	0	0	2 (1.3%)	0.891	3 (0.8%)
Anti-HBs < 10	1 (4%)	8 (6%)	7 (50%)	9 (23%)	37 (24.5%)	< 0.001	62 (17%)
Anti-HBs 10-100	9 (36%)	28 (20.7%)	2 (14.3%)	15 (38.5%)	49 (32.5%)	< 0.001	103 (28.2%)
Anti-HBs > 100	15 (60%)	99 (73.3%)	5 (35.7%)	15 (38.5%)	65 (43%)	< 0.001	199 (54.7%)
Anti-HBs (+)	24 (96%)	127 (94%)	7 (50%)	30 (77%)	114 (75.5%)	< 0.001	302 (82.9%)
Anti-HCV	0	0	0	0	0	-	-
Anti-HIV	0	0	0	0	0	-	-

seroprevalence rates in healthcare workers were 5.57% for HBsAg and 34.94% for anti-HBs, while the seroprevalence rates in blood donors were 6% for HBsAg and 31% for anti-HBs, and the rates between healthcare workers and blood donors were similar.

Studies conducted in Turkey revealed that the prevalence of HBsAg positivity among healthcare personnel ranged from 0% to 3.6%, and the prevalence of anti-HBs positivity ranged from 55.71% to 86.7% [10,15-31]. In this study, the rates of HBsAg positivity and anti-HBs positivity were 0.8% and 82.9%, respectively, similar to the rates in Turkey.

Several studies investigating HBsAg seroprevalence among healthcare workers have been conducted around the world. Rates of HBV infection and/or vaccination of healthcare workers in different parts of the world are highly variable [5]. In a meta-analysis of studies published between 1970 and 2019 on the prevalence of HBV serologic markers in healthcare workers worldwide, the seroprevalence of HBsAg and Anti-HBs was 2.3% and 56.6%, respectively. HBV infection is more prevalent among health workers in low-income countries, especially in Africa. HBV vaccination rates among healthcare workers were highest in high-income countries such as Europe, the Eastern Mediterranean, and the Western Pacific [5]. In a study conducted in Southern Ghana, HBsAg positivity was observed at a rate of 5.9% among healthcare workers [32]; it was found to be 5% in Asia and Africa [33]. In a study conducted in Korea, HBsAg and anti-HBs positivity rates among healthcare workers were found to be 2.4% and 76.9% [34], while HBsAg and anti-HBs and anti-HCV positivity rates in France were reported to be 0%, 91.6% and 0.7%, respectively [35]. In a study conducted in Hungary, the rates of HBsAg and anti-HCV positivity among healthcare workers were 1.3% and 1.56% [36]. In Japan, HBsAg and anti-HBs and anti-HCV positivity rates were reported as 0%, 51.8% and 0%, respectively [37]. A meta-analysis conducted in Eastern Mediterranean and Middle Eastern countries found that the HBsAg positivity rate among healthcare workers was 2.7%, with the highest rate in Sudan (6.85%) and the lowest rate in Turkey (1%), and a study among European Union countries found that the rate ranged from 0.6 to 2.2% among healthcare workers [38,39]. These changes depend on many factors, such as sociodemographic factors, risk factors for transmission, protective factors (vaccination policies, education level, accessibility to protective equipment, implementation of barrier measures against occupational exposure to blood) [40].

CDC recommends HBV vaccination for all healthcare workers and measurement of anti-HBs level after 4-6 weeks [41]. People with anti-HBs levels < 10 mIU/mL after the primary vaccine series should be revaccinated with a series of 3 doses and tested again for anti-HBs 1-2 months after the third dose. People who do not respond to revaccination should be tested for HBsAg and anti-HBc. If HBsAg is negative, persons should be considered susceptible to HBV infection and evaluated for post-exposure prophylaxis [42]. In this study, two personnel were not vaccinated again because their anti-HBs levels did not reach a sufficient level despite two series of vaccination.

With the availability of the HBV vaccine, the incidence of the disease and HBV-related mortality rates have decreased. In 1982, ACIP recommended that all healthcare workers be vaccinated against HBV [43,44]. WHO recognized HBV as an occupational disease in 1992 because healthcare workers are at risk [45]. In Turkey, healthcare workers have been screened and vaccinated for hepatitis B since 1996 [46]. In our study, personnel who were not immune to HBV were included in the vaccination program by the Infection Control Committee.

In Turkey, the average anti-HCV positivity rate is around 1% among the general population [12]. In various studies conducted among healthcare workers, this rate was found to be 0.12% [26], 0.2% [9,15,17], 0.3% [20], 0.4% [22,28], 1.1% [18]. In this study, all healthcare workers tested negative for anti-HCV. Similar to this study, there are studies in which anti-HCV positivity was not found among healthcare workers [10,16,19,22-24,29,30].

From 1985, when the first HIV case was reported in Turkey, until November 08, 2023, there have been 39,437 HIV-positive people and 2,295 AIDS cases reported with positive confirmation tests. Among the reported cases, sexual transmission is 95.6%, transmission through intravenous drug use is 2% and mother-to-infant transmission is 1.2%. The total number of reported cases of nosocomial transmission is 91 patients, the rate is 0.22 [47]. In studies conducted in Turkey, anti-HIV positivity was not detected among healthcare workers [9,15-20,22,23,29,30]. Consistent with the studies conducted in Turkey, this study did not detect anti-HIV positivity.

Conclusions

The results of this study emphasize the significance of routine screening and vaccination procedures for healthcare workers to mitigate the incidence of infectious diseases in clinical environments. Identifying differences in infection rates and immune responses

across various occupational groups necessitates targeted health interventions for these populations. Healthcare workers should receive education on infection prevention, and individuals at risk of infections should be vaccinated.

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Conflict of interests

No conflict of interests is declared.

References

1. World Health Organization (2016) Health care worker safety. Available: https://iris.who.int/bitstream/handle/10665/68354/WHO_BCT_03.11.pdf?sequence=1. Accessed: 5 July 2024.
2. Prüss-Ustün A, Rapiti E, Hutin Y (2005) Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. Am J Ind Med 48: 482-90. doi: 10.1002/ajim.20230.
3. Centers for Disease Control and Prevention (2024) Global viral hepatitis. Available: https://www.cdc.gov/hepatitis/global/. Accessed:10 July 2024.
4. Jha AK, Chadha S, Bhalla P, Saini S (2012) Hepatitis B infection in microbiology laboratory workers: prevalence, vaccination, and immunity status. Hepat Res Treat 2012: 520362. doi: 10.1155/2012/520362.
5. Mahamat G, Kenmoe S, Akazong EW, Ebogo-Belobo JT, Mbaga DS, Bowo-Ngandji A, Foe-Essomba JR, Amougou-Atsama M, Monamele CG, MbongueMikangue CA, Kame-Ngasse GI, Magoudjou-Pekam JN, Zemnou-Tepap C, Meta-Djomsi D, Maïdadi-Foudi M, Touangnou-Chamda SA, Daha-Tchoffo AG, Selly-Ngaloumo AA, Nayang-Mundo RA, Yéngué JF, Taya-Fokou JB, Fokou LKM, Kenfack-Momo R, TchamiNgongang D, Atembeh Noura E, Tazokong HR, DemeniEmoh CP, Kengne-Ndé C, Bigna JJ, Boyomo O, Njouom R (2021) Global prevalence of hepatitis B virus serological markers among healthcare workers: A systematic review and meta-analysis. World J Hepatol 13: 1190-1202. doi: 10.4254/wjh.v13.i9.1190.
6. Hoshi Y, Hasegawa T, Yamagishi N, Mizokami M, Sugiyama M, Matsubayashi K, Uchida S, Nagai T, SatakeM (2019) Optimal titer of anti-HBs in blood components derived from donors with anti-HBc. Transfusion 59: 2602-11. doi: 10.1111/trf.15393.
7. Shin BM, Jeong KW (2000) Distribution of anti-HBs levels in Korean adults. Yonsei Med J 41: 40-8. doi: 10.3349/ymj.2000.41.1.40.
8. World Health Organization (2024) Protecting the health and safety of health workers. Available: https://www.who.int/activities/protecting-health-and-safety-of-health-workers. Accessed: 24 July 2024.
9. Bayar F, Görgü N (2022) Evaluation of hepatitis-A, hepatitis-B, hepatitis-C and HIV seroprevalence in employees of an education and research hospital. Kirikkale Med J 24: 491-5. doi: 10.24938/kutfd.1107402. [Article in Turkish]
10. Demir Ş, Apaydın H, Karadeniz A (2021) Seroprevalence and immunization status of hepatitis A, hepatitis B, hepatitis C seroprevalence in health care workers in a medical faculty hospital. Sakarya Med J 11: 360-5. doi:10.31832/smj.806090. [Article in Turkish]
11. Gülaçtı U (2013) Seroprevalence of Hepatitis B and C in Elazığ Harput State Hospital Employees. Konuralp Med J 5: 5-8. [Article in Turkish]
12. Tozun N, Ozdogan O, Cakaloglu Y, Idilman R, Karasu Z, Akarca U, Kaymakoglu S, Ergonul O (2015) Seroprevalence of hepatitis B and C virus infections and risk factors in Turkey: a fieldwork TURHEP study. Clin Microbiol Infect 21: 1020-6. doi: 10.1016/j.cmi.2015.06.028.
13. Ozsoy M, Oncul O, Cavuslu S, Erdemoglu A, Emekdas G, PahsaA (2003) Seroprevalences of hepatitis B and C among health care workers in Turkey.Viral Hepat J 10: 150-6. doi: 10.1046/j.1365-2893.2003.
14. Aktaş F, Karabiber N, Saydam G (1990) A comparison of the frequency of hepatitis B surface antigen and antibody in hospital and nonhospital personnel. Mikrobiol Bul 24: 299-306.
15. Korkmaz P, Aykın N, Alpay Y, Güldüren H, Doğru-Yaşar Z, Uğur M (2013) Seroprevalence of hepatitis A, B, C, and HIV infection among healthcare workers in a state hospital. Klimik J 26: 64-7. doi: 10.5152/kd.2013.20. [Article in Turkish]
16. Kader Ç, Balcı M, Erdoğan Y, Göçmen AY, Meşeüzümveren B, Ünsal G, ErbayA (2012) Seroprevalence of hepatitis B, hepatitis C, and HIV among healthcare workers at Bozok university medical faculty hospital and hepatitis B vaccination status. Flora 3: 126-31. [Article in Turkish]
17. Kepenek Kurt E (2017) Investigation of the seroprevalence of hepatitis B, hepatitis C, and HIV viruses in hospital employees. Selçuk Med J 33: 45-9. [Article in Turkish]
18. Tekin A, Deveci Ö (2015) Seroprevalence of HBV, HCV, and HIV among employees of a state hospital. J Clin Exp Invest 1: 99-103. doi: 10.5799/ahinjs.01.2010.02.0020. [Article in Turkish]
19. Ceylan MR, Çelik M, Gürbüz E, Esmer F, Koç S (2022) Hepatitis A, hepatitis B, hepatitis C and HIV seroprevalence in healthcare workers. Onl Turk J Health Sci 7: 420-4. doi: 10.26453/otjhs.1062233. [Article in Turkish]
20. İnci M, Aksebzeci AT, Yağmur G, Kartal B, Emiroğlu M, Erdem Y (2009) Investigation of HBV, HCV and HIV seropositivity in healthcare workers. Turk Hygiene and Exp Biol 66: 59-66. [Article in Turkish]
21. Öksüz Ş, Yıldırım M, Özaydın Ç, Şahin İ, Arabacı H, Gemici G (2009) Investigation of HBV and HCV seroprevalence among healthcare workers in a state hospital. Ankem J 23: 30-3. [Article in Turkish]
22. Özer B, İnci M, Duran N, Sapan E, ErkaslanAlagöz G, Köksaldı Motor V (2011) Comparison of HBV, HCV, and HIV seropositivity in university hospital healthcare workers with

hospital admittance. J Exp Clin Med 27: 46-9. doi: 10.5835/jecm.omu.27.02.002. [Article in Turkish]
23. Öncül A, Aslan S, Pirinççioğlu H, Özbek E (2012) Determination of HBV, HCV, HIV, VDRL seropositivity and vaccination rates among employees of Diyarbakır state hospital. J Exp Clin Med 29: 280-4. doi: 10.5835/jecm.omu.29.04.006 [Article in Turkish]
24. Güzelant A, Kurtoğlu M, Kaya M, Keşli R, Baysal B (2008) Investigation of Hepatitis B, Hepatitis C, and HIV Seroprevalence and Risk Factors in Blood Donors and Employees of an Oral-Dental Health Center. Turk J Infect 22: 189-195. [Article in Turkish]
25. Tekin-Koruk S, Koruk İ, Şahin M, DuyguF (2009) Evaluation of HBsAg, anti-HBs, and anti-HCV positivity and risk factors among oral and dental health workers in Şanlıurfa. Klimik J 22: 55-61. [Article in Turkish]
26. Baysal B, Kaya Ş (2012) Seroprevalence of HBV, HCV, and HIV among the staff of a Training and Research Hospital. Viral Hepat J 18. doi: 10.4274/Vhd.43531.
27. Demir İ, Kaya S, Demirci M, Arıdoğan C (2006) Investigation of hepatitis B virus seropositivity among healthcare personnel in Isparta. Turk J Infect 20: 183-7. [Article in Turkish]
28. Özçimen S, Kacar F, Korkmaz F, Özcan M, Karataş H, Sakız A (2014) Seroprevalences of Hepatitis B and C among healthcare workers in Konya research training hospital. Eur J of Med Sci 4: 7-11. doi: 10.15197/sabad.2.4.02.
29. Uludağ Altun H, Eraslan A, Özdemir G (2012) Seroprevalences of HBV, HCV and HIV among healthcare workers in a secondary care hospital. Viral Hepat J 18. doi: 10.4274/Vhd.65375. [Article in Turkish]
30. Boşnak V, Karaoğlan İ, Namıduru M, Şahin A (2013) Seroprevalences of Hepatitis B, Hepatitis C, HIV of the healthcare workers in the Gaziantep university Sahinbey research and training hospital. Viral Hepat J 19. doi: 10.4274/Vhd.69188. [Article in Turkish]
31. Akçalı A, Şener A, Tatman Otkun M, Akgöz S, Otkun A (2013) Hepatitis B Seroprevalance among health care workers in a tertiary hospital. Viral Hepat J 19. doi: 10.4274/Vhd.99609. [Article in Turkish]
32. Efua SV, Adwoa WD, Armah D (2023) Seroprevalence of Hepatitis B virus infection and associated factors among health care workers in southern Ghana. IJID Reg 6: 84-9. doi: 10.1016/j.ijregi.2023.01.009.
33. Maamor NH, Muhamad NA, Mohd Dali NS, Abdul Mutalip MH, Leman FN, Aris T, Lai NM, Abu Hassan MR (2022) Seroprevalence of hepatitis B among healthcare workers in Asia and Africa and its association with their knowledge and awareness: a systematic review and meta-analysis. Front Public Health 10: 859350. doi: 10.3389/fpubh.2022.859350.
34. Shin BM, Yoo HM, Lee AS, Park SK (2006) Seroprevalence of hepatitis B virus among health care workers in Korea. J Korean Med Sci 21: 58-62. doi: 10.3346/jkms.2006.21.1.58.
35. Djeriri K, Fontana L, Laurichesse H, Peigue-Lafeuille H, Henquell C, Chamoux A, Beytout J, Catilina P, Rey M (1996) Seroprevalence of markers of viral hepatitis A, B and C in hospital personnel at the Clermont-Ferrand university hospital center. Presse Med 25: 145-50.
36. Lehel F, Csajbókné BM, HangyálZ (1998) Study of viral infections among hospital personnel. Orv Hetil 139: 115-9.
37. Nagao Y, Matsuoka H, Kawaguchi T, Ide T, Sata M (2008) HBV and HCV infection in Japanese dental care workers. Int J Mol Med 21: 791-9. doi: 10.3892/ijmm.21.6.791.
38. Babanejad M, Izadi N, Alavian SM (2019) A systematic review and meta-analysis on the prevalence of HBsAg in health care workers from eastern mediterranean and middle eastern countries. Int J Prev Med 10: 144. doi: 10.4103/ijpvm.IJPVM_111_18.
39. Tavoschi L, Mason L, Petriti U, Bunge E, Veldhuijzen I, Duffell E (2019) Hepatitis B and C among healthcare workers and patient groups at increased risk of iatrogenic transmission in the European union/European economic Area. J Hosp Infect.102: 359-68. doi: 10.1016/j.jhin.2019.03.004.
40. Bwogi J, Braka F, Makumbi I, Mishra V, Bakamutumaho B, Nanyunja M, Opio A, Downing R, Biryahwaho B, Lewis RF (2009) Hepatitis B infection is highly endemic in Uganda: findings from a national serosurvey. Afr Health Sci 9: 98-108.
41. Hepatitis B foundation (2024) Hepatitis B information for healthcare workers. Available: http://www.hepb.org/. Accessed: 06 September 2024.
42. Workowski KA, Bachmann LH, Chan PA, Johnston CM, Muzny CA, Park I, Reno H, Zenilman JM, Bolan GA (2021) Sexually transmitted infections treatment guidelines, 2021. MMWR Recomm Rep 70: 1-187. doi: 10.15585/mmwr.rr7004a1.
43. Schillie S, Murphy TV, Sawyer M, Ly K, Hughes E, Jiles R, de Perio MA, Reilly M, Byrd K, Ward JW (2013) CDC guidance for evaluating health-care personnel for hepatitis B virus protection and for administering postexposure management. MMWR Recomm Rep 62: 1-19.
44. Advisory Committee on Immunization Practices, Centers for Disease Control and Prevention (CDC) (2011) Immunization of health-care personnel: recommendations of the advisory committee on immunization practices (ACIP). MMWR Recomm Rep 60: 1-45.44.
45. Kunches LM, Craven DE, Werner BG, Jacobs LM (1983) Hepatitis B exposure in emergency medical personnel: prevalence of serologic markers and need for immunization. Am J Med 75: 269-72. doi: 10.1016/0002-9343(83)91204-4.
46. Ergönül Ö, Işık H, Baykam N, Erbay A, Dokuzoğuz B, Müftüoğlu O (2001) Hepatitis B infection among healthcare workers at Ankara numune training and research hospital. Viral Hepat J 2: 327-9. [Article in Turkish]
47. Republic of Turkey ministry of health, general directorate of public health, infectious diseases and early warning department presidency (2023) HIV-AIDS statistics. Available: https://hsgm.saglik.gov.tr/depo/birimler/bulasici-hastaliklar-ve-erken-uyari-db/Dokumanlar/Istatistikler/hiv-aids-2023.pdf. Accessed: 20 September 2024.