

Original Article

Seroprevalence and Risk Factors for Hepatitis B, Hepatitis C, and HIV in a Substance Abuse Treatment CenterHatice Burcu Açıklalın Arıkan^{1,2}, Nesrin Türker³, Başak Bağcı⁴, Seval Çalışkan Pala⁵¹Department of Infectious Diseases and Clinical Microbiology, Soma State Hospital, Manisa, Turkey²Department of Infectious Diseases and Clinical Microbiology, Buca Seyfi Demirsoy Training and Research Hospital, İzmir, Turkey³Department of Infectious Diseases and Clinical Microbiology, İzmir Katip Çelebi University Atatürk Training and Research Hospital, İzmir, Turkey⁴Department of Psychiatry, İzmir Katip Çelebi University Atatürk Training and Research Hospital, İzmir, Turkey⁵Eskişehir Provincial Health Directorate, Turkey**Abstract**

Introduction: Alcohol and substance use disorders are important public health problems with an increased risk for bloodborne and sexually transmitted infections. **Objectives:** To determine the frequency and risk factors of hepatitis B, hepatitis C and HIV in individuals with drug and alcohol addiction.

Methodology: This prospective study was conducted in the outpatient clinic of Alcohol and Substance Abuse Treatment and Education Center (ASATEC), İzmir, Turkey. Detailed anamneses were taken from alcohol and/or drug addicts who applied to the outpatient clinic; HBV, HCV, HIV serology results in the last 6 months were examined.

Results: The study group consisted of 478 persons, including 112 (23.4%) alcohol addicts, 322 (67.4%) substance addicts, and 44 (9.2%) combined alcohol and substance addicts. The mean age of the cases was 32 ± 11 years and 432 (90.4%) were male. Drug injection and needle sharing was recorded in 16.5% and 9.8% of participants, respectively. Hepatitis B surface antigen (HBsAg) positivity was found in 2.7%, anti-HCV positivity in 9.6% and HIV Ag/Ab positivity in 1.9% of the cases. Among patients using intravenous drugs, HBsAg positivity was found in 2%, anti-HCV positivity in 55%, while HIV Ag/Ab positivity was not detected. A history of sexually transmitted disease was a risk factor for HBsAg, HIV Ag/Ab positivity. Intravenous drug use, needle sharing and ecstasy use were determined as risk factors for anti-HCV positivity. **Conclusions:** Risky behaviors for HBV, HCV and HIV transmission are high in alcohol and substance addicts. The use of ecstasy is a novel risk factor for HCV transmission.

Key words: addiction; ecstasy; HBV; HCV; HIV; seroprevalence.*J Infect Dev Ctries* 2024; 18(7):1082-1089. doi:10.3855/jidc.19453

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Copyright © 2024 Açıklalın Arıkan *et al.* This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**Introduction**

Alcohol and substance use disorder is an important public health problem with many negative consequences, especially affecting young people, including an increased risk for bloodborne and sexually transmitted infections [1], particularly hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). The many risk factors for transmission of these infections include sharing needles and equipment, tattooing, piercing in unhygienic conditions, unprotected sexual intercourse, chemical sex, multiple sexual partner history and sharing intranasal pipettes in substance use [2,3].

According to World Drug Report data, approximately 284 million people aged between 15 and 64 years used drugs worldwide in 2020, with the majority being young people. It is estimated that

approximately 5.5 million (49%) of Persons Who Inject Drugs (PWIDs) are infected with HCV, 1.4 million (12.4%) with HIV and 883,000 (7.9%) with HCV [4]. According to the data from the Turkish Ministry of Health in 2021, among individuals admitted due to injection drug use, 43.8% tested positive for HCV, 4.4% for HBV, and 1.3% for HIV [5]. Individuals with substance addiction and high-risk sexual behavior must be screened for HBV, HCV and HIV. It is recommended to start treatment immediately on detection of HCV, and within 2 weeks of detection of HIV, when not differently indicated due to factors such as specific opportunistic infections [6,7].

In Turkey, alcohol and substance addiction treatment and follow-up are carried out by the Alcohol and Substance Abuse Treatment and Education Center (ASATEC) in İzmir, western Turkey [5]. However,

there is a lack of sufficient prospective studies in Turkey (in ASATEC) that demonstrate the seroprevalence of hepatitis and HIV infections in alcohol and drug users. Therefore, there are still problems in Turkey regarding the eradication of hepatitis B and C and ensuring access to treatment for individuals infected with HIV. Today, the routes of administration and types of substance used vary in this patient group and, at the same time, risky behaviors may occur because of substance abuse. There is a need for further studies for a better understanding of these risky behaviors and identification of new substance use trends.

In this study, we aimed to determine the frequency and the risk factors associated with HBV, HCV and HIV infections among drug and alcohol addicts, referring to ASATEC outpatient clinic.

Methodology

Patient selection

This single-center prospective study was conducted in the ASATEC clinic in a tertiary care university hospital, which is visited by an average of 700 new patients per month, in the city center of Izmir, in western Turkey. A standard anamnesis form was completed by alcohol and/or substance addiction patients who had applied to the ASATEC clinic between 1 June 2021 and 31 August 2021. Recent serology test results of patients, conducted for HBV, HCV, HIV screening within the last six months, were accessed via the hospital information system. Local ethics committee approval, dated 18 March 2021 and numbered GOKAE-0185, was obtained.

Inclusion criteria for this study were patients having applied to ASATEC, with a serology result within the last 6 months, who answered questions in the anamnesis form and who were over the age of 18 years. Patients who did not agree to participate in the study, were under 18 years of age or did not have a serology result within the last 6 months were excluded.

Evaluation methods

A standardized anamnesis form was created for the included patients. Each patient’s age, gender, marital status, educational status, profession, income level, sexual orientation, place of domicile and partner, reason for application to ASATEC, current and previously used substances, intravenous substance use, needle sharing, high-risk unprotected sexual behavior under the influence of drugs or otherwise, piercings/tattoos, criminal conviction, surgery, blood transfusion, history of sexually transmitted diseases (STDs), and hepatitis B vaccination status was recorded.

HBsAg (hepatitis B surface antigen), anti-HCV (hepatitis C antibody), HIV Ag/Ab (antigen/antibody) (HIV-1/HIV-2 IgM and IgG antibodies and HIV-1 p24 antigen) and anti-HBs (hepatitis B surface antibody) results, obtained within the previous 6 months from the blood samples, sent to the microbiology laboratory within the last 6 months, using Abbott Architect I2000SR macro-ELISA (enzyme-linked immunosorbent assay) autoanalyzer device (Abbott, USA) by using a chemiluminescence immunoassay technique. Results were evaluated according to the manufacturer’s instructions. Results greater than 0.90 U/L for HBsAg, 0.90 U/L for anti-HCV and 1 U/L for HIV Ag/Ab were deemed to be positive. Confirmation of HIV Ag/Ab-positive samples was made using the HIV 1/2 rapid differentiation test. Samples with anti-HBs concentrations ≥ 10.0 U/L were deemed to be

Table 1. Sociodemographic characteristics and addiction of patients.

Characteristic	n (%)
Age	
Mean±SD	32±11 years
Median [range]	29 [18-78] years
Gender	
Male	432 (90.4)
Female	46 (9.6)
Marital status	
Single	300 (62.8)
Married	178 (37.2)
Sexual orientation	
Heterosexual	466 (97.5)
Homosexual	8 (1.7)
Bisexual	4 (0.8)
Educational status	
Illiterate	4 (0.8)
Primary education	278 (58.2)
High school	152 (31.8)
University	44 (9.2)
Occupation	
Unemployed	217 (45.4)
Temporary worker	125 (26.1)
Public official	93 (19.5)
Other	21 (4.4)
Hairdresser	13 (2.7)
Healthcare professional	9 (1.9)
Monthly income level	
No income	202 (42.3)
Less-than-minimum wage	34 (7.1)
Minimum wage	118 (24.7)
Over minimum wage	124 (25.9)
Place of residence	
With family	388 (81.2)
Alone	67 (14.0)
With a friend	20 (4.2)
Homeless	3 (0.6)
Addiction	
Substance	322 (67.4)
Alcohol	112 (23.4)
Alcohol and substance	44 (9.2)
Total	478 (100)

positive. HBsAg, anti-HCV, anti-HBs and HIV Ag/Ab parameters were deemed to be dependent variables.

Statistical evaluation of data

Provided data was evaluated using Statistical Package for Social Sciences (SPSS) 15.0. Descriptive statistics were given as mean, standard deviation and median for numerical variables and as figures and percentages for categorical variables. To test the compliance of data with a normal distribution, the Kolmogorov–Smirnov test was applied. In the comparison of characteristics of groups, chi-square test, Fisher’s exact test, advanced chi-square test and logistic regression analysis were used for categorical variables. Statistical significance level was defined as $p \leq 0.05$.

Results

A total of 972 individuals were invited to participate, with 494 (50.8%) opting not to join the study. The final study population consisted of a total of 478 cases, including 112 (23.4%) patients with alcohol addiction, 322 (67.4%) patients with substance addiction and 44 (9.2%) patients with both alcohol and substance addiction. Mean age (standard deviation, SD) was 32 ± 11 years. In this population, 305 cases (63.8%) were in the 25-44 years age group. In total, 432 (90.4%) of the patients were male and 300 (62.8%) were single. While 278 (58.2%) of the cases only had had primary education, 217 (45.4%) were unemployed and 202 (42.3%) had no income. Sociodemographic data is provided in Table 1.

While substances most frequently used in the past by the study population were the cannabinoids ($n = 279$; 58.4%), heroin ($n = 230$; 48.1%) and alcohol ($n = 229$; 47.9%), the most frequent currently used substances were heroin ($n = 156$; 32.6%), alcohol ($n = 152$; 31.8%) and methamphetamine ($n = 120$; 25.1%). When the study population was categorized by risk factors, it was seen that 79 (16.5%) cases were Persons Who Inject Drugs (PWIDs), 47 (9.8%) had practiced needle sharing, and 252 (52.7%) had unprotected sexual intercourse, of these 47 (9.8%) had sex under influence of drugs (chemsex), 251 (52.5%) had tattoos/piercings, 149 (31.2%) had a criminal conviction and 124 (25.9%) had history of surgery.

Evaluation of HBsAg results

HBsAg was positive in 13 (2.7%) cases and both HBsAg and anti-HCV were positive in one (0.2%) case. Twelve of the HBsAg-positive cases (92.3%) were male. When considered within the framework of risk factors, only the history of STDs was found to be significantly higher in HBsAg-positive group ($p = 0.001$) (Table 2). On generation of a multiple regression model, it was found that the odds ratio (OR) was 29.411 times higher in [confidence interval (CI): 5.48-157.82] in patients with a history of STDs (Table 3).

Evaluation of anti-HBS results

In the study group, anti-HBs was positive in 233 (48.7%) cases. Among these, 215 of the anti-HBs-positive cases (92.3%) were male. It was seen that anti-HBs negativity was more common in the 45-64-year

Table 2. Comparison of serology results of patients with respect to risk factors for HBV, HCV and HIV.

	HBsAg			Anti-HCV			HIV Ag/Ab		
	Negative N (%)	Positive N (%)	p-value	Negative N (%)	Positive N (%)	p-value	Negative N (%)	Positive N (%)	p-value
Unprotected sexual intercourse									
No	220 (97.3)	6 (2.7)	1.000	199 (88.1)	27 (11.9)	0.103	225 (99.6)	1 (0.4)	0.040
Yes	245 (97.2)	7 (2.8)		233 (92.5)	19 (7.5)		244 (96.8)	8 (3.2)	
Chemsex									
No	286 (97.2)	8 (2.8)	1.000	259 (88.1)	35 (11.9)	0.033	292 (99.3)	2 (0.7)	0.031
Yes	179 (97.2)	5 (2.8)		173 (94)	11 (6)		177 (96.2)	7 (3.8)	
History of STDs									
No	438(98.2)	8 (1.8)	0.001	407 (91.3)	39 (8.7)	0.025	442 (99.1)	4 (0.9)	0.001
Yes	27 (84.4)	5 (15.6)		25 (78.1)	7 (21.9)		27 (84.4)	5(15.6)	
Tattoos/piercings									
No	221 (97.4)	6 (2.6)	1.000	208 (91.6)	19 (8.4)	0.377	222 (97.8)	5 (2.2)	0.742
Yes	244 (97.2)	7 (2.8)		224 (89.2)	27(10.8)		247 (98.4)	4 (1.6)	
Conviction									
No	321 (97.6)	8 (2.4)	0.555	306(93)	23 (7)	0.004	322 (97.9)	7 (2.1)	0.727
Yes	144 (96.6)	5 (3.4)		126 (84.6)	23 (15.4)		147 (98.7)	2 (1.3)	
Surgery									
No	345 (97.5)	9 (2.5)	0.749	320 (90.4)	34 (9.6)	1.000	346 (97.7)	8 (2.3)	0.458
Yes	120 (96.8)	4 (3.2)		112 (90.3)	12 (9.7)		123 (99.2)	1 (0.8)	
Blood transfusion									
No	444 (97.6)	11(2.4)	0.125	409 (89.9)	46 (10.1)	0.151	447 (98.2)	8 (1.8)	0.361
Yes	21 (91.3)	2 (8.7)		23 (100.0)	0 (0)		22 (95.7)	1 (4.3)	

* Values in bold are significant ($p \leq 0.05$).

Table 3. Determination of risk factors for HBsAg, anti-HBs, anti-HCV and HIV Ag/Ab positivity using multiple logistic regression model.

	Risk factor	Odds ratio	95% Confidence interval	p-value
HBsAg	History of STDs	29.411	5.481-157.821	0.001
	HBV vaccination	1.940	1.003-3.752	0.049
Anti-HBs	Drug injection	1.898	1.046-3.441	0.035
	Ecstasy use	6.232	1.033-37.612	0.046
Anti-HCV	Drug injection	43.304	5.578-336.167	0.001
	Needle sharing	33.796	7.029-162.491	0.001
HIV Ag/Ab	History of STDs	80.606	7.283-892.114	0.001

age group ($p = 0.002$). Anti-HBs positivity was found to be higher in persons, who had been vaccinated for HBV ($p = 0.005$). Creation of a multiple logistic regression model showed that anti-HBs positivity had an OR 1.940 times higher (CI: 1.003-3.752) in persons who had been vaccinated for hepatitis B and an OR 1.898 times higher (CI: 1.046-4.441) in PWIDs (Table 3).

Evaluation of anti-HCV results

Anti-HCV was positive in 46 (9.6%) cases. Of these, 44 of anti-HCV-positive cases (95.7%) were male. When currently and previously used substances were compared, anti-HCV positivity was significantly higher in the patients with a history of alcohol or heroin use ($p = 0.002$ or $p = 0.001$, respectively); also, it was found that patients with current use of alcohol, cocaine, heroin or morphine had significantly higher anti-HCV positivity ($p = 0.013$, 0.011, 0.001 or 0.017, respectively). Comparison of anti-HCV-positive and -negative cases by previously and currently used substances is given in Table 4. Anti-HCV positivity was found to be significantly higher in persons with a

conviction and with a history of STD ($p = 0.004$ and $p = 0.025$, respectively). These findings are listed in Table 2. The rates of drug use through injection and sharing injection equipment were significantly higher in anti-HCV positive cases, with 44 (55.7%) and 37 (78.7%), respectively ($p = 0.001$ and $p = 0.001$). These findings are listed in Table 5. A multiple logistic regression model was generated with variables that may constitute a risk factor for HCV infection. As a result of analysis, anti-HCV positivity was found to have an OR 6.232 times higher in users of 3,4-methylenedioxymethamphetamine (MDMA; ecstasy) (CI: 1.033-37.612), an OR 43,304 times higher (CI: 5.578-336.167) in PWIDs and an OR 33.796 times higher (CI: 7.029-162.491) in persons who were engaged in needle sharing (Table 3).

Evaluation of HIV Ag/Ab results

When HIV Ag/Ab results were evaluated, 9 (1.9%) cases had positive HIV Ag/Ab test, with coherent HIV confirmation tests for these patients. All patients were male; eight cases (88.8%) were in the 25-44 years age group. Intravenous drug use was not observed in any of

Table 4. Comparison of anti-HCV-positive and -negative cases by previously and currently used substances.

Substance		Previous use		p-value	Current use		p-value
		Negative N (%)	Positive N (%)		Negative N (%)	Positive N (%)	
Alcohol	No	285 (87.4)	41 (12.6)	0.002	217 (87.1)	32 (12.9)	0.013
	Yes	147 (96.7)	5 (3.3)		215 (93.9)	14 (6.1)	
Cocaine	No	406 (90.6)	42 (9.4)	0.516	328 (92.4)	27 (7.6)	0.011
	Yes	26 (86.7)	4 (13.3)		104 (84.6)	19 (15.4)	
Heroin	No	306 (95)	16 (5)	0.001	248(100.0)	0 (0)	0.001
	Yes	126 (80.8)	30 (19.2)		184 (80)	46 (20)	
Morphine	No	427 (90.5)	45 (9.5)	0.457	420 (91.1)	41 (8.9)	0.017
	Yes	5 (83.3)	1 (16.7)		12 (70.6)	5 (29.4)	
Cannabinoids	No	354 (90.8)	36 (9.2)	0.680	185 (93)	14 (7)	0.105
	Yes	78 (88.6)	10 (11.4)		247 (88.5)	32 (11.5)	
Synthetic cannabinoids	No	405 (89.8)	46(10.2)	0.095	342 (90.5)	36 (9.5)	1.000
	Yes	27 (100.0)	0 (0)		90 (90)	10 (10)	
Methamphetamine	No	321 (89.7)	37 (9.3)	0.537	251 (90.9)	25 (9.1)	0.624
	Yes	111 (92.5)	9 (7.5)		181 (89.6)	21 (10.4)	
Ecstasy	No	392 (90.3)	42 (9.7)	0.580	273 (91.6)	25 (8.4)	0.239
	Yes	40 (90.9)	4 (9.1)		159 (88.3)	21 (11.7)	
LSD-mushrooms	No	431 (90.4)	46 (9.6)	0.904	414 (90.8)	42 (9.2)	0.163
	Yes	1 (100.0)	0 (0)		18 (81.8)	4 (18.2)	
Volatiles	No	424 (90.4)	45 (9.6)	0.601	384 (90.6)	40 (9.4)	0.882
	Yes	8 (88.9)	1 (11.1)		48 (88.9)	6 (11.1)	
Gabapentin- pregabalin	No	354 (89.2)	43(10.8)	0.076	431 (90.4)	46 (9.6)	0.157
	Yes	78 (96.3)	3 (3.7)		1 (100.0)	0 (0)	
Total		432 (90.4)	46 (9.6)		432 (90.4)	46 (9.6)	

* Values in bold are significant ($p \leq 0.05$).

Table 5. Comparison of anti-HCV-negative and -positive subjects by route of administration and needle sharing habits.

	Negative N (%)	Positive N (%)	p-value
Drug injection			
No	397 (99.5)	2 (0.5)	0.001
Yes	35 (44.3)	44 (55.7)	
Needle sharing			
No	422 (97.9)	9 (2.1)	0.001
Yes	10 (21.3)	37 (78.7)	

the HIV-positive patients. HIV infection was significantly higher in patients with a history of unprotected high-risk sexual behavior, chemsex and patients with a history of STD ($p = 0.040$, $p = 0.031$ and $p = 0.001$, respectively) (Table 2). A multiple logistic regression model was generated with variables that may constitute a risk factor for HIV infection - it was found that HIV infection had an OR 80.606 times higher (CI: 7.283-892.114) in patients with a history of STDs (Table 3).

Discussion

Alcohol and substance addicts must be particularly investigated for their various high-risk behaviors with respect to HBV, HCV and HIV infections [1]. The majority of seroprevalence studies in Turkey have only been conducted on PWIDs. In Turkey, the number of prospective studies that have been conducted on PWIDs, non-injecting drug users and alcohol addicts is quite low. In this study, designed as a prospective study and conducted on PWIDs/non-PWID drug users and alcohol addicts, HBV, HCV and HIV seroprevalence was 2.7%, 9.6% and 1.9%, respectively. The most important risk factor for HBV and HIV infections was found to be a history of STD. Ecstasy use, intravenous drug use and needle sharing were the most important risk factors for anti-HCV positivity. In this study, ecstasy was found to be a novel and important risk factor for anti-HCV positivity.

In our study, the majority of substance users were young and middle-aged, and they were predominantly male. Globally and in Turkey, the majority of substance users also constitute a population that is mostly male and falls within the young and middle-aged range. Our sociodemographic data align with both Turkey and global patterns [4,5].

HBV, HCV and HIV seroprevalences in retrospective studies conducted on cases, followed-up by various ASATEC clinics in our country due to alcohol and substance addiction, are similar to those found in our study [8-11]. In a study conducted on substance-dependent individuals in Turkey in 2012, the positivity for anti-HBs was found to be 38% [10]. However, it was seen that anti-HBs seroprevalence was higher in our study. A possible reason for this was the initiation in 1998 of a national vaccination program for HBV in persons born during and after 1991, since the majority of cases in this study belonged to a younger age group [12].

In this study, PWIDs were examined as a subgroup in our study, it was seen that had a HBsAg positivity rate was of 2% and the anti-HCV positivity rate was of 55%. According to the World Drug Report, approximately 49% of PWIDs are infected with hepatitis C, 12.4% with hepatitis B, and 7.9% with HIV. According to the European Drug Report, the rates vary, with 13-86% being infected with hepatitis C, 5.3% with hepatitis B, and 5.2% with HIV [4,13] (Table 6). When the results of studies, conducted worldwide and the results of European Drug Report, compiling data from 15 countries that had national data, are compared, it was seen that hepatitis C seroprevalence in our study in PWID group was consistent with European and world data. However, in this subgroup, hepatitis B and HIV infection seroprevalences were lower compared to European and world data [4,13,14]. The region where our study was conducted has a low prevalence of hepatitis B in Turkey; therefore, we found a low prevalence of hepatitis B in our study [15]. Low HIV infection prevalence may be explained by the principal transmission route of HIV infection being sexual contact [16]. When compared to data from Turkey as a

Table 6. Comparative analysis of viral hepatitis and HIV prevalence in substance abusers.

	Year	Patients	HBsAg positive N (%)	Anti-HCV positive N (%)	HIV Ag/Ab positive N (%)	Total N
This study	2021	Substance abusers (various routes and substances)	13 (2.7)	46 (9.6)	9 (1.9)	478
This study	2021	People who inject drugs	2 (2.5)	44 (55.7)	0	79
World Drug Report [4]	2022	People who inject drugs	883,000 (7.9)	5.5 million (49)	1.4 million (12.4)	7.8 million
European Drug Report [13]	2021	People who inject drugs*	(1.3–8.9)	(13-86)	563 (5.2)	129,703
Turkish Drug Report [5]	2021	People who inject drugs	65 (4.4)	642 (43.8)	19 (1.3)	1,465

* In 15 countries that had national data.

whole, HBsAg seroprevalence was similar in PWIDs, yet anti-HCV seroprevalence was higher [11,17,18]. High anti-HCV seroprevalence in this subgroup shows that there were problems in terms of diagnosis, treatment and prevention. To control HCV infection in Turkey in this risk group, rapid diagnostic testing is needed both to facilitate treatment and to maintain screening efforts due to the risk of re-infection with HCV in this group following treatment.

In our study, a history of STD was determined to be the most important risk factor for HBsAg positivity in alcohol and substance addicts, as a result of unprotected sexual intercourse. In the literature, it has been shown that the prevalence of high-risk sexual behavior and STDs was high among drug addicts and the frequency of HBV infection was high among this group [19-21]. It has been reported that the frequency of unprotected sexual intercourse increased under the influence of alcohol and substances, which supports the hepatitis B risk factors determined in our study [22,23].

In our study, a significant correlation of anti-HBs positivity was found with HBV vaccination and intravenous drug use. Since the majority of our study population consisted of young individuals, this may be explained by childhood vaccinations. However, since it could also be an indicator of natural immunity, it is possible that anti-HBs positivity in PWIDs could be related to natural immunity. Since anti-HBc results were not examined in our study, the distinction between natural immunity and vaccine-induced immunity was not made. There is a need for more comprehensive studies related to hepatitis B infection, vaccination and immune response in substance addicts.

In our study, while anti-HCV positivity was more common in previous users of heroin, anti-HCV positivity was found to be more frequent in persons currently using cocaine, heroin or morphine. The most important risk factors for HCV were ecstasy use, intravenous drug use and sharing needles. Previous studies in Turkey have shown that the substance with the most frequent intravenous use was heroin and most of the anti-HCV positive cases were opiate users [10,17]. In recent studies, it has been stated that drug users had started to use many different agents, such as amphetamines, cocaine and ecstasy via injection, using methods such as melting and dissolution [14,24,25]. According to the European Drug Report data, half or more of the syringes used in recent years attracted attention because they contain multiple substances and stimulants such as ecstasy [14]. It has been shown that the use of psychostimulants such as ecstasy has increased due to their effect on sex drive, and they

increased the risk of HCV and HIV infection in users due to high-risk sexual behavior [23]. It is contemplated that the reason for the high frequency of anti-HCV positivity among the users of cocaine, morphine and ecstasy was the widespread intravenous use of these substances. We believe that ecstasy, which we identified as a new and significant risk factor, increased HCV transmission between partners owing to its wide availability and its use for chemsex.

In addition, in our study, anti-HCV positivity was found to be significantly higher in persons with alcohol addiction, a criminal conviction and a history of STDs. Studies have shown that hepatitis C virus infection was more common in individuals with alcohol abuse [2,26]. In the literature, ex-convicts and PWIDs were specified as the highest risk group for anti-HCV positivity and it is contemplated that use of shared drug-taking equipment was the cause for this in ex-convicts [27,28]. In a study conducted by Spada *et al.*, it was shown that sexual transmission of HCV was very common among drug addicts [29].

In our study, HIV infection prevalence was found to be significantly higher in persons with a history of unprotected high-risk sexual behavior, chemsex and STDs. It was determined that a history of STD was the most important risk factor for HIV infection. In our study, no drug injection was determined in patients infected with HIV. It is known that the majority of HIV infections in Turkey are caused by unprotected sexual intercourse. The national database does not contain sufficient information concerning risk factors in HIV-positive individuals who use drugs and chemsex [16]. In foreign studies, it has been shown that sexual intercourse under the influence of substances, also known as ‘chemsex’, was common, in particular among HIV-positive individuals in order to enhance libido, and the tendency to unsafe and high-risk sexual behavior was more common during these encounters [31-33]. It has been reported that in substance addicts the rate of unsafe sexual intercourse and therefore risk of STDs and HIV infection increased [33]. In substance addicts, the most important routes of transmission for HIV are high-risk sexual behavior and history of STDs. Therefore, it is very important to screen substance addicts and their partners for HIV infection.

This study has two main limitations. Firstly, the route of use of ecstasy is not known because study participants were not asked in which way they used it. Instead, patients were asked whether they had ever injected drugs. Secondly, since the patients were not tested for anti-HBc, the distinction between hepatitis B

vaccine and natural immunity could not be made clearly.

In summary, in this study, HBV, HCV and HIV seroprevalences have been determined in alcohol and substance addicts. The most important risk factor for HBV and HIV infections is was the history of sexually transmitted disease STDs. For HCV infection, the most important risk factors were found to be intravenous drug use, needle sharing and ecstasy use. In this study, it was shown that ecstasy use was found to be a new novel and important risk factor for HCV and it is contemplated that this finding will provide a contribution to literature in the following years. It was concluded that, in this patient group, it was necessary to question determine the substances used, different their routes of administration of these substances and high-risk sexual behavior. Additionally, more frequent serological screening should be conducted in this group and their selected sexual partners, and emphasis should be placed on sexual education.

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Authors' contributions

HBAA and NT planned and designed the study. HBAA and BB conducted data collection. SÇP performed the statistical analysis of the data. NT, BB, and SÇP contributed important intellectual content. All authors contributed to the interpretation of the data. HBAA wrote the initial manuscript draft. All authors critically reviewed and approved the final version. HBAA is acting as the guarantor of this manuscript.

Ethics statement

The ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Izmir Katip Celebi University, dated 18 March 2021, and numbered GOKAE-0185.

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