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Research Article

Presence of psychiatric comorbidities, concurrent alcohol and substance use disorders, and HBV, HCV, and HIV seroprevalence in patients with gambling disorder: a retrospective study

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Abstract

Objective: Gambling disorder (GD) is a public health concern frequently associated with psychiatric and alcohol/substance use comorbidities. While screening for blood-borne infections (hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)) is standard in substance use treatment, seroprevalence data among individuals with GD remain limited. This study evaluated psychiatric comorbidities, concurrent alcohol/substance use disorders, and HBV, HCV, and HIV seroprevalence in GD patients attending a behavioral addiction clinic. **Methods:** This retrospective study evaluated 177 patients diagnosed with GD (DSM-5 criteria) at Ankara Etlik City Hospital (January-July 2025). Sociodemographic data, substance use history, and psychiatric comorbidities were extracted from medical records. Viral markers (HBsAg, anti-HCV, anti-HIV) were analyzed via ELISA. Statistical analyses included Student's t-test, Mann-Whitney U test, Chi-square test, and Odds Ratio (OR) with 95% confidence intervals. **Results:** Participants were predominantly male (94,9%); mean age was 34,32±7,82 years. HBsAg and anti-HCV positivity were both 0.6%; no HIV-positive cases were detected. Psychiatric comorbidity was present in 59,9% of patients, and 16.9% had concurrent alcohol/substance use disorders. Significant risk factors for additional addictions were being childless (OR: 2,45, p=0.030) and having psychiatric comorbidity (OR: 12,38, p=0.001). Physical comorbidities increased psychiatric disorder risk 4,82-fold (p=0.027). **Conclusion:** Although viral seroprevalence was low, psychiatric and addiction-related comorbidities were prevalent among patients with GD. These findings underscore that a multidisciplinary assessment approach and targeted infection screening for appropriate high-risk individuals may be beneficial in behavioral addiction settings. Further studies with larger, diverse populations are warranted to confirm these observations.

Keywords: Gambling disorder, Behavioral addiction, Hepatitis B virus, Hepatitis C virus, Human immunodeficiency virus, Infectious disease

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INTRODUCTION

Addiction is a multidimensional chronic phenomenon characterized by an uncontrollable need for a substance or behavior, the persistence of pleasure-seeking as a result of alterations in brain chemistry and the continuation of the action despite adverse consequences (Potenza, 2008; Sadock et al., 2022). There are many subtypes of addiction. Under the heading of Mental, Behavioral or Neurodevelopmental Disorders in the World Health Organization's (WHO) International Classification of Diseases 11th Revision (ICD-11), alcohol and substance use disorders are included under detailed subheadings. Behavioral addictions, in contrast to the ICD-10, are classified in the ICD-11 as 'gambling disorder' and 'gaming disorder'. Furthermore, there is an observed increase in the prevalence of other types of behavioral addictions, such as pornography, eating, and shopping addictions, and findings regarding the clinical and societal significance of these disorders are being increasingly emphasized in the literature (Alimoradi et al., 2022).

GD is a form of behavioral addiction that leads to functional impairment in an individual's social, economic, academic, and health domains, as well as causing familial problems. Due to the global proliferation of online gambling, the incidence of GD has steadily increased, rendering it a public health problem (Petry, 2005). According to WHO 2024 data, it is reported that approximately 1.2% of the global adult population suffers from GD. Numerous studies identify factors such as young age, male gender, low socioeconomic status, comorbid psychiatric illnesses, childhood traumas, and a family history of gambling and substance use disorders as risk factors (Dowling et al., 2017; Çakmak & Tamam, 2018).

Addiction processes entail not only psychological deterioration but also severe physical complications and infection risks. In individuals with alcohol and substance use disorders, the incidence of Blood-Borne Infections (HIV, HBV, and HCV) is significantly higher compared to the general population due to impulsivity, loss of cognitive control, and risky behaviors (e.g., needle sharing, unprotected sexual intercourse) (Stein et al., 2000; Degenhardt et al., 2017). In GD and alcohol-substance use disorders, the repetitive and excessive activation of reward circuits, particularly the mesolimbic dopaminergic pathway, reinforces pleasure-seeking and contributes to the maintenance of addictive behaviors (Potenza, 2008; Grant et al., 2010; Barnes et al., 2015).

The high level of impulsivity observed in cases diagnosed with GD can lead individuals to seek immediate rewards, experience impairment in cognitive reasoning processes, and consequently engage in behaviors that pose a risk for viral transmission (unprotected sexual contact, multiple partners, etc.) (Stein et al., 2000; Potenza, 2008; Grant & Chamberlain, 2014). In this context, determining viral seroprevalence in the GD population is considered a critical necessity for both the optimization of individual health management and breaking the chain of transmission within the scope of public health strategies (Degenhardt et al., 2017; Republic of Turkey Ministry of Health General Directorate of Public Health [HSGM], 2025). Although current clinical guidelines recommend routine screening for HBV, HCV, and HIV in individuals with alcohol and substance use disorders (Turkish Association for the Study of the Liver [TKAD] & Viral Hepatitis Society [VHSD], 2023; WHO, 2025), these data are quite limited in the literature regarding behavioral addictions and specifically GD (Langan et al., 2019).

When the literature is reviewed, it is notable that GD and alcohol and substance use disorders are frequently observed together. Global-scale epidemiological research conducted on the co-occurrence of these two clinical presentations also supports this close relationship (Grant et al., 2010; Lorains et al., 2011). In contrast, the relevant literature has generally prioritized the diagnostic processes, psychopathological characteristics, and neurocognitive dimensions of GD (Petry, 2005; Petry et al., 2005; Lorains et al., 2011); the potential risks this population carries in terms of infectious diseases

and the associated screening requirements have been addressed to a more limited extent (Langan et al., 2019). This situation highlights a gap in the literature regarding the holistic and multidisciplinary clinical management of GD. The primary aim of this study was to contribute to the existing literature by retrospectively analyzing HIV, HCV and HBV seroprevalence among patients diagnosed with GD who presented to a behavioral addiction outpatient clinic. In this retrospective study, psychiatric comorbidities, co-occurring alcohol and substance use disorders, and the seroprevalence of HBV, HCV and HIV were comprehensively evaluated among patients with GD attending a specialized behavioral addiction outpatient clinic. The primary aim of the study was to characterize the psychiatric and addiction-related clinical features of this patient population alongside viral serological findings and to contribute to the limited body of evidence available in the literature. Furthermore, it was anticipated that the integrated assessment of psychiatric comorbidities, co-occurring substance use disorders, and infection seroprevalence would provide a more comprehensive understanding of the clinical profile and risk characteristics of individuals with GD and offer insights relevant to their clinical evaluation and follow-up.

METHODS

Study Design and Sample

The study population of this retrospective research comprised 177 patients diagnosed with gambling disorder according to American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition (DSM-5) criteria, who presented to the Ankara Etlik City Hospital, Department of Psychiatry, Behavioral Addiction Outpatient Clinic between January 1, 2025 and July 1, 2025.

In the Behavioral Addiction Outpatient Clinic at Ankara Etlik City Hospital, individuals diagnosed with gambling disorder, gaming disorder, compulsive shopping, and pornography addiction are enrolled in structured follow-up and treatment programs. Referrals to the clinic are facilitated by other psychiatry specialists following clinical evaluations of confirmed or suspected behavioral addiction. Upon initial admission, all patients are routinely subjected to comprehensive biochemical screening, ELISA testing, and psychometric evaluations. The laboratory data (HbsAg, anti-HBs, anti-HCV, and anti-HIV) utilized in this study were obtained from these routine clinical procedures.

Procedure

All individuals presenting to the outpatient clinic underwent assessment of behavioral addiction severity using the South Oaks Gambling Screen (SOGS). In addition, the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) were administered. Comorbid alcohol use disorder and substance use disorder were diagnosed through structured clinical interviews based on the DSM-5 diagnostic criteria and were evaluated as separate clinical variables; therefore, they were not included within the category of psychiatric comorbidities. Psychiatric comorbidities were likewise identified through structured clinical interviews conducted in accordance with DSM-5 diagnostic criteria, and included conditions such as anxiety disorders, depressive disorders, and obsessive-compulsive and related disorders.

A comprehensive mental status examination was performed for each individual and sociodemographic characteristics, psychiatric comorbidities, and additional physical comorbid conditions were recorded. Physical comorbidities evaluated within the scope of the study included diabetes mellitus (DM), hypertension, coronary artery disease (CAD), and chronic kidney disease (CKD). The study included all patients who applied to the Behavioral Addiction Outpatient Clinic during the specified period, were diagnosed with gambling disorder, and had the required laboratory data available in the hospital records system.

This study was approved by the Ethics Committee of Ankara Etlik City Hospital with the decision dated 16/07/2025 and numbered AEŞH-BADEK1-2025-297 and was conducted in accordance with the principles of the Declaration of Helsinki. Strict adherence was maintained to ethical principles regarding the confidentiality and privacy of all participants' data.

Statistical Analysis

Statistical analyses were performed using SPSS version 27 (*Statistical Package for the Social Sciences*). Descriptive statistics were used to present quantitative variables as mean, standard deviation, median, minimum, and maximum values, while qualitative variables were expressed as frequencies and percentages. The conformity of data to a normal distribution was evaluated using the Kolmogorov-Smirnov test and Box Plot diagrams.

For the comparison of two independent quantitative groups, Student's t-test was utilized for normally distributed data, whereas the Mann-Whitney U test was employed for variables that did not follow a normal distribution. Qualitative data were compared using the Chi-Square test, Fisher's Exact test. Risk factors associated with the presence of additional addiction(s) were evaluated using backward stepwise logistic regression analysis. Results were evaluated within a 95% confidence interval, and the level of statistical significance was set at $p<0.05$.

RESULTS

The study population comprised a total of 177 cases, consisting of 94.9% (n=168) males and 5.1% (n=9) females. The ages of the participants ranged from 19 to 51 years, with a mean age of 34.32±7.82 years. Regarding marital status, 62.1% (n=110) were married, 36.2% (n=64) were single and 1.7% (n=3) were divorced. In terms of parental status, 51.4% (n=91) of the participants had children, while 48.6% (n=86) did not. Analysis of residential status and living arrangements revealed that 91.5% (n=162) lived with their families, 7.3% (n=13) lived alone, and 1.1% (n=2) resided with friends or other individuals. Evaluation of educational status revealed that 9.0% of the sample (n=16) had an education level of primary education or below, 48.6% (n=86) were high school graduates, and 42.4% (n=75) had undergraduate or postgraduate degrees. In terms of economic profile, 92.7% of the participants (n=164) had a regular income, whereas 7.3% (n=13) reported having no regular income. These findings indicate that the study population predominantly consisted of young, male individuals with moderate-to-high educational attainment and a high rate of employment **(Table 1).**

All individuals included in the study were being followed with a diagnosis of GD. When additional addictive disorders accompanying GD were evaluated, 16.9% of the cases (n=30) were found to have at least one additional addiction diagnosis. Among these individuals, 43.3% (n=13) had alcohol use disorder, 30.0% (n=9) had substance use disorder and 26.7% (n=8) had both alcohol and substance use disorders. Evaluation of the psychiatric and physical health profiles of the sample demonstrated that 59.9% of the cases (n=106) had at least one comorbid psychiatric disorder, while 8.5% (n=15) had accompanying physical comorbidities, including DM, hypertension, CAD and CKD. Data concerning risky behaviors and medical history showed low frequencies for intravenous substance use (1.1%, n=2) and history of surgical operations (3.4%, n=6). Regarding serological findings, anti-HIV results were negative for all participants (n=177). Seropositivity for HBsAg and anti-HCV was detected in only one case each (0.6%), with these parameters remaining negative for the remaining 99.4% (n=176) of the cohort. These findings indicate that while the prevalence of infectious diseases is low within this behavioral addiction group, the levels of comorbid psychiatric disorders and additional addictions are notably high **(Table 2).**

Table 1. Distribution of Descriptive Characteristics			
Variable		**n**	**(%)**
Gender	**Male**	*168*	*94.9*
	Female	*9*	*5.1*
Age;years	*Mean±SD*	*34.32±7.82*	
	Median (Min-Max)	*33 (19-51)*	
Marital status	**Married**	*110*	*62.1*
	Single	*64*	*36.2*
	Divorced	*3*	*1.7*
Presence of children	**Yes**	*91*	*51.4*
	No	*86*	*48.6*
Living arrangement	**With family**	*162*	*91.5*
	Alone	*13*	*7.3*
	Friends and other	*2*	*1.1*
Educational level	**Primary education or below**	*16*	*9.0*
	High school	*86*	*48.6*
	University	*75*	*42.4*
Income status; TL	**No income**	*13*	*7.3*
	With income	*164*	*92.7*

Table 2. Distribution of Participant Characteristics			
Variable		**n**	**(%)**
Additional addiction	**None**	*147*	*83.1*
	Present	*30*	*16.9*
	-Alcohol	*13*	*43.3*
	-Substance	*9*	*30.0*
	- Alcohol and substance	*8*	*26.7*
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	**Present**	*15*	*8.5*
	None	*162*	*91.5*
Comorbid psychiatric disorder	**Present**	*106*	*59.9*
	None	*71*	*40.1*
Duration of addiction (years)	*Mean±SD*	*9.10±6.75*	
	Median (Min-Max)	*8 (1-30)*	
IV drug use	**No**	*175*	*98.9*
	Yes	*2*	*1.1*
Surgical history	**None**	*171*	*96.6*
	Yes	*6*	*3.4*
HBsAg	**Negative**	*176*	*99.4*
	Positive	*1*	*0.6*
Anti HCV	**Negative**	*176*	*99.4*
	Positive	*1*	*0.6*
Anti HIV	**Negative**	*177*	*100*
	Positive	*0*	*0*

When analyzing the relationships between the presence of additional addiction and demographic variables, no statistically significant differences were found regarding gender, living arrangement, education level or income status (p>0.05). Conversely, the ages of patients with comorbid addiction were found to be statistically significantly lower compared to those without additional addiction (p=0.002; p<0.01). Regarding the marital status variable, a statistically significant association was identified between the presence of additional addiction and marital status (p=0.021; p<0.05). This finding indicates that the proportion of single individuals was higher, while the proportion of married individuals was significantly lower in the group with comorbid addiction. Similarly, a significant correlation was observed between parental status and the risk of additional addiction. It was determined that the probability of having an additional addiction was 2.45 times higher in childless individuals compared to those with children (OR=2.45; 95% CI:1.05–5.72; p = 0.030) **(Table 3).**

Table 3. Comparison of Descriptive Characteristics Based on the Presence of Additional Addiction

Variable		Additional Addiction				p
	No		Yes			
	n=147	%	n=30	%		
Gender	Male	139	94.6	29	96.7	[a]***1.000***
	Female	8	5.4	1	3.3	
Age	*Mean±SD* *Median (Min-Max)*	*35.15±7.86* *34 (21-51)*		*30.27±6.29* *30 (19-45)*		[b]***0.002****
Marital status	Married	97	66	13	43.3	[c]***0.021****
	Single	47	32	17	56.7	
	[†]Divorced	3	2	0	0	
Parental status	Yes	81	55.1	10	33.3	[c]***0.030****
	No	66	44.9	20	66.7	
Living arrangement	With family	135	91.8	27	90	[a]***0.470***
	Alone	10	6.8	3	10	
	[†]Friends and others	2	1.4	0	0	
Educational level	Primary education and below	12	8.2	4	13.3	[c]***0.066***
	High school	67	45.6	19	63.3	
	University	68	46.3	7	23.3	
Income status	No income	10	6.8	3	10	[a]***0.464***
	With income	137	93.2	27	90	

*†Excluded from evaluation due to case numbers.. aFisher Exact Test; bStudent-t Test; cPearson Chi-Square Test; *p<0.05; **p<0.01*

When examining the clinical factors influencing the risk of additional addiction, it was found that individuals with comorbid psychiatric illnesses were 12.38 times more likely to have an additional addiction compared to those without such a diagnosis, a finding that reached high statistical significance (OR=12.38; 95% CI:2.84–53.9; p=0.001). Similarly, additional psychiatric comorbidity was numerically more frequent among cases with a history of intravenous substance use and both individuals with intravenous substance use were found to have accompanying psychiatric disorders. However, due to the very limited number of cases with intravenous substance use, statistical analysis could not be performed for this variable.

Analysis of addiction duration demonstrated that individuals with additional addictive disorders had a statistically significantly shorter duration of addiction compared to those without additional addiction (p=0.003; p<0.01). On the other hand, no statistically significant association was identified between the presence of comorbid physical illness, history of surgical operation, and the occurrence of additional addiction (p>0.05). Only one case was found to be anti-HCV positive and this individual had an accompanying psychiatric comorbidity. Similarly, only one case was HBsAg positive, and no additional psychiatric disorder was identified in this patient. However, due to the insufficient number of cases in both groups, statistical analysis could not be performed **(Table 4).**

Table 4. Comparison of Participant Characteristics Based on the Presence of Additional Addiction

Variable		Additional Addiction				p
	No		Yes			
	n=147	%	n=30	%		
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	Present	13	8.8	2	6.7	[a]***1.000***
	None	134	91.2	28	93.3	
Comorbid psychiatric disorder	Present	78	53.1	28	93.3	[c]***0.001****
	None	69	46.9)	2	6.7	
Duration of addiction (years)	Mean±SD	9.35±6.70		7.87±6.98		[d]***0.003****
	Median (Min-Max)	8 (1-27)		5 (1-30)		
IV drug use	No	147	100	28	93.3	-
	†Yes	0	0	2	6.7	
Surgical history	None	143	97.3	28	93.3	[a]***0.269***
	Yes	4	2.7	2	6.7	
HBsAg	Negative	146	99.3	30	100	-
	†Positive	1	0.7	0	0	
Anti HCV	Negative	147	100	29	96.7	-
	†Positive	0	0	1	3.3	

† Excluded from evaluation due to case numbers
*aFisher Exact Test; cPearson Chi-Square Test; dMann Whitney-U Test; *p<0.05; **p<0.01*

Upon analysis of the relationship between the presence of comorbid psychiatric illness and sociodemographic characteristics, no statistically significant differences were observed across variables including gender, age, marital status, parental status, living arrangement, educational level or income status (p>0.05) **(Table 5).**

When the relationship between clinical characteristics and the presence of additional psychiatric disorders was evaluated, individuals with accompanying physical comorbidities were found to have a 4.82-fold higher likelihood of having an additional psychiatric disorder compared to those without physical illness and this association was statistically significant (OR=4.82; 95% CI:1.05–22.0; p=0.027). In contrast, no statistically significant difference was observed between the presence of additional psychiatric disorders and addiction duration or history of surgical operation (p>0.05). Serological parameters, including intravenous substance use, HBsAg and anti-HCV positivity, were not included in the comparative analysis due to the limited number of cases **(Table 6).**

To identify risk factors associated with the presence of additional addictions, age, educational status, marital status, presence of psychiatric comorbidity, duration of addiction, and parental status were included in a backward stepwise logistic regression analysis. The final model obtained after four steps is presented in **Table 7.**

Table 5. Comparison of Descriptive Characteristics Based on the Presence of Comorbid Psychiatric Illness

Variable	Comorbid Psychiatric Illness					p
	Yes		No			
	n=106	%	n=71	%		
Gender	**Male**	*98*	*92.5*	*70*	*98.6*	[a]***0.087***
	Female	*8*	*7.5*	*1*	*1.4*	
Age	*Mean±SD*	*34.06±7.16*		*34.72±8.75*		[b]***0.583***
	Median (Min-Max)	*34 (19-50)*		*31 (21-51)*		
Marital status	**Married**	*63*	*59.4*	*47*	*66.2*	[c]***0.499***
	Single	*40*	*37.7*	*24*	*33.8*	
	[†]**Divorced**	*3*	*2.8*	*0*	*0*	
Parental status	**Yes**	*55*	*51.9*	*36*	*50.7*	[c]***0.877***
	No	*51*	*48.1*	*35*	*49.3*	
Living arrangement	**With family**	*96*	*90.6*	*66*	*93*	[c]***0.480***
	Alone	*9*	*8.5*	*4*	*5.6*	
	[†]**Friends and others**	*1*	*0.9*	*1*	*1.4*	
Educational level	**Primary education and below**	*8*	*7.6*	*8*	*11.3*	[c]***0.636***
	High school	*51*	*48.1*	*35*	*49.3*	
	University	*47*	*44.3*	*28*	*39.4*	
Income status	**No income**	*9*	*8.5*	*4*	*5.6*	[c]***0.475***
	With income	*97*	*91.5*	*67*	*94.4*	

† Excluded from evaluation due to case numbers
aFisher Exact Test; bStudent-t Test; cPearson Chi-Square Test

In the final model, age the presence of psychiatric comorbidity, and educational status emerged as independent factors significantly associated with additional addictions. The explanatory power of the model was 85.9%.

According to the model, each one-unit increase in age was associated with a reduction in the risk of additional addictions (OR=0.891, 95% CI:0.826–0.961). In contrast, the presence of a psychiatric comorbidity increased the risk of additional addictions by 21.732-fold (OR=21.732, 95% CI:4.115–114.773).

Using university education as the reference category, individuals with a primary school education or lower had a 6.239-fold higher risk of additional addictions (OR=6.239, 95% CI:1.099–35.412), whereas high school graduates had a 3.034-fold higher risk (OR=3.034, 95% CI:1.081–8.520) compared with those holding a university degree.

DISCUSSION

This study aimed to evaluate psychiatric comorbidities, concurrent alcohol and substance use disorders and the seroprevalence of HBV, HCV and HIV among patients diagnosed with GD who presented to the Behavioral Addiction Outpatient Clinic of the Department of Psychiatry at Ankara Etlik City Hospital. In addition, by examining the sociodemographic and clinical characteristics of these patients, the study sought to provide a more comprehensive characterization of the clinical

profile associated with GD. Given the limited number of studies in our country investigating psychiatric comorbidities and viral seroprevalence concurrently in individuals with GD, the present findings are expected to contribute to the existing literature. The use of standardized ELISA assays for HBsAg, anti-HCV, and anti-HIV testing in all participants represents a methodological strength that enhances the consistency and reliability of the data. Furthermore, by integrating perspectives from addiction psychiatry and infectious diseases, this interdisciplinary approach may improve the understanding of the complex clinical needs of this patient population and highlight the importance of comprehensive screening and multidisciplinary follow-up strategies.

Table 6. Comparison of Participant Characteristics Based on the Presence of Comorbid Psychiatric Illness

Variable		Comorbid Psychiatric Illness				p
	Yes		No			
	n=106	%	n=71	%		
Comorbid physical illnesses (DM, Hypertension, CAD, CKD)	Present	13	12.3	2	2.8	[c]***0.027****
	None	93	87.7	69	97.2	
Duration of addiction (years)	Mean±SD	9.01±6.69		9.23±6.88		[d]***0.945***
	Median (Min-Max)	8 (1-30)		7 (1-27)		
IV drug use	No	104	98.1	71	100	-
	†Yes	2	1.9	0	0	
Surgical history	None	102	96.2	69	97.2	[a]***1.000***
	Yes	4	3.8	2	2.8	
HBsAg	Negative	106	100	70	98.6	-
	†Positive	0	0	1	1.4	
Anti-HCV	Negative	105	99.1	71	100	-
	†Positive	1	0.9	0	0	

† Excluded from evaluation due to case numbers
*aFisher Exact Test cPearson Chi-Square Test; dMann Whitney-U Test;*p<0.05;*

Table 7. Logistic Regression Analysis of Risk Factors Associated with Additional Addictions

	B	p	ODDS	%95 CI	
				Lower	Upper
Constant	-1.145	***0.422***	0.318		
Age	-0.116	***0.003****	0.891	0.826	0.961
Comorbid psychiatric disorder (present)	3.079	***0.001****	21.732	4.115	114.773
Educational level (University)		***0.044****			
Educational level (Primary education and below)	1.831	***0.039****	6.239	1.099	35.412
Educational level (High school)	1.110	***0.035****	3.034	1.081	8.520

**p<0.05* ***p<0.01*

In our study, the participant profile (largely composed of young, male, and actively employed individuals) is consistent with the sociodemographic risk factors frequently highlighted for GD in the literature (Dowling et al., 2017; Çakmak & Tamam, 2018; Moreira et al., 2023; Tran et al., 2024). The male predominance observed in GD and other behavioral addictions is attributed to differences in

neurobiologically based impulsivity and risk-taking tendencies (Potenza, 2008; Cross et al., 2011), as well as societal gender norms (Fattore et al., 2014; Merkouris et al., 2016).

The literature indicates that the prevalence of blood-borne infections, including HBV, HCV and HIV is higher among individuals with alcohol and substance use disorders than in the general population (Degenhardt et al., 2017; Keskin & Güzel, 2025; Yıldırım et al., 2025). Given the frequent comorbidity between behavioral addictions and substance use disorders, this increased risk of infection is attributable not only to biological routes of transmission but also to the behavioral and social factors associated with the addiction process. In particular, the sharing of injection equipment during intravenous substance use is recognized as one of the major risk factors for the transmission of blood-borne pathogens, especially HBV and HCV. In our study, hepatitis serological positivity was observed descriptively among participants with a history of intravenous substance use; however, statistical analysis could not be performed because of the limited number of cases in this subgroup.

Furthermore, alcohol and psychoactive substance use are known to increase impulsivity and impair decision-making processes, thereby contributing to a greater likelihood of engaging in high-risk behaviors such as unprotected sexual intercourse and having multiple sexual partners (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005; Grant & Chamberlain, 2014). Previous studies have further demonstrated that these behavioral patterns not only facilitate the transmission of infectious diseases but also contribute to a higher overall infection burden through delayed healthcare utilization, reduced participation in routine screening programs, and poor adherence to treatment (Altice et al., 2010; Grebely et al., 2015).

In our study, the detected HBsAg positivity rate of 0.6% (n=1) was found to be relatively low when compared with the global average prevalence of approximately 3.5% (despite regional variations), the reported rate of approximately 4% for the Turkish general population, and prevalence values in the literature for individuals with substance use disorders, which range between 2.2% and 5.5% (Türker et al., 2022; Yıldırım et al., 2025). The literature emphasizes that populations diagnosed with alcohol and substance use disorders possess a higher risk profile for HBV infection compared to the general population (Degenhardt et al., 2017; Keskin & Güzel, 2025; Yıldırım et al., 2025). This increased risk is associated with variables such as intravenous substance use, the sharing of contaminated equipment, and risky sexual behavior patterns (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005). In this context, it can be stated that the HBsAg prevalence obtained in our study diverges from the findings of numerous studies focusing on substance use.

Similarly, the 0.6% (n=1) anti-HCV positivity identified in our study appears generally consistent with reported data indicating that approximately 0.7% of the adult population worldwide is infected with HCV, as well as prevalence values slightly below the estimated 0.3% for the general population of Turkey (TKAD & VHSD, 2023). Furthermore, the literature highlights opioid use disorder and intravenous substance use as being among the most potent risk factors for HCV infection, with reported seropositivity rates in these groups reaching over 52% (Degenhardt et al., 2017; Toker Uğurlu et al., 2020; Ceylan et al., 2022; Tariq et al., 2022; Yıldırım et al., 2025). Accordingly, the detection of anti-HCV positivity in one of the two participants with a history of intravenous substance use in our study, although insufficient to permit statistical inference because of the limited sample size, represents a noteworthy observation that underscores the importance of parenteral transmission in the epidemiology of HCV infection.

In our study, all participants were found to be seronegative for anti-HIV, a finding consistent with Türkiye overall low-prevalence epidemiological profile in light of both national and global epidemiological data (HSGM, 2024; The Joint United

Nations Programme on HIV/AIDS [UNAIDS], 2024; WHO, 2025). According to UNAIDS (2024) and WHO (2025) reports, approximately 40.8 million individuals worldwide are living with HIV, and the prevalence in the adult population ranges between 0.7% and 0.8%. While these rates are substantially higher in endemic regions such as Sub-Saharan Africa, Türkiye continues to be classified among low-prevalence countries according to WHO criteria. Data published by HSGM in 2024 also indicate that although the number of registered HIV cases in Türkiye exceeds 51.000, the prevalence in the general population remains below 0.1%. In this context, the absence of anti-HIV seropositive cases in our sample appears to be compatible with the low-prevalence epidemiological structure observed in our country. Nevertheless, considering the relatively limited sample size of the study, it should also be acknowledged that low-frequency HIV infections may not have been represented within the sample, which may have contributed to the observed seroprevalence rate of 0%.

The low viral seroprevalence observed in our study is likely to reflect the combined influence of multiple factors. Among individuals with alcohol and substance use disorders, the principal determinants of viral transmission include intravenous substance use, syringe sharing and engagement in high-risk sexual behaviors while under the influence of substances (Stein et al., 2000; Rees et al., 2001; Topçuoğlu & Bez, 2005). In contrast, 83.1% of the patients with GD in our cohort had no history of an additional addiction and only 1.1% (n = 2) reported a history of intravenous substance use, suggesting that the study population had a relatively low-risk behavioral profile.

In addition, the national HBV vaccination program implemented in Türkiye since 1998 has made a substantial contribution to increasing population immunity, particularly among young adults (Türker et al., 2022; HSGM, 2025). Given that the mean age of our study population was 34.2 years, it is plausible that a considerable proportion of participants may have benefited from the protective effects of this vaccination strategy.

Nevertheless, the identification of only one HBsAg-positive case and one anti-HCV-positive case warrants cautious interpretation of the observed seroprevalence rates. In addition to the possibility that these infections are genuinely uncommon in the study population, the limited sample size and the very low number of positive cases may also have contributed to the findings. Accordingly, the current study design does not permit attribution of the low viral seroprevalence to any single factor. Rather, the results should be interpreted within a multifactorial framework that considers the behavioral characteristics of the sample, population-level preventive health measures and the methodological limitations of the study.

The finding that 59.9% of patients diagnosed with GD in our sample had at least one psychiatric comorbidity and that 16.9% had a concurrent alcohol and/or substance use disorder suggests that psychiatric comorbidities and additional addictions are common in this patient population, highlighting the potentially complex clinical nature of GD. These high comorbidity rates are consistent with literature emphasizing that GD, rather than being an isolated issue, shows high rates of co-occurrence with other psychopathologies such as depression, anxiety, attention deficit, impulse control, and personality disorders (Petry et al., 2005; Rodriguez-Monguio et al., 2017). This supports the perspective that behavioral addictions might best be approached not only as independent clinical entities but also as significant indicators of potential psychiatric comorbidities (Demiralay et al., 2021).

The analyses performed provide important data regarding the sociodemographic correlates of this clinical picture. Within our cohort, it was observed that patients with an additional addiction were significantly younger ($p=0.002$) and had higher rates of being single ($p=0.021$). Specifically, the finding that childless individuals had a 2.45-fold higher probability of having an additional addiction compared to those with children (OR=2.45; $p=0.030$) parallels the relevant literature, where

factors such as young age, single marital status and childlessness are considered significant risk factors for the development of additional addictions (Barnes et al., 2015; Moreira et al., 2023). It is hypothesized that these demographic characteristics may contribute to additional addiction processes by influencing individuals' tendency toward risky behaviors and their level of openness to new experiences (Potenza, 2008; Çakmak & Tamam, 2018). In this context, it is thought that the absence of social control and responsibility mechanisms, such as marriage and parenthood, may leave young GD patients more vulnerable to other addictions and potentially contribute to the expansion of the addiction spectrum (Dowling et al., 2017).

Our clinical findings suggest a close relationship between GD, alcohol/substance use disorders, and psychiatric comorbidities. In particular, the 12.38-fold higher likelihood of an additional addiction among individuals with a comorbid psychiatric disorder (OR=12.38; p=0.001) points to a substantial degree of overlap between these clinical conditions.

Biopsychosocial models propose that alcohol and substance use disorders and behavioral addictions share common neurobiological mechanisms, particularly within the mesolimbic dopaminergic system responsible for reward processing, motivation and impulse control. Functional alterations within this system are thought to contribute to the development of similar behavioral patterns and phenotypic characteristics across both forms of addiction (Griffiths, 2005; Potenza, 2008; Barnes et al., 2015).

Hypersensitivity of the dopaminergic system and impaired impulse control may further weaken individuals' ability to regulate their behavior and adversely affect treatment adherence (Potenza, 2008; Kaya et al., 2019; Grant & Chamberlain, 2014; Miezah et al., 2024). Consequently, behavioral addictions appear to exhibit important similarities to alcohol and substance use disorders not only in terms of their neurobiological underpinnings but also with respect to clinical course and treatment response (Petry, 2005; Potenza, 2008; Grant et al., 2010). In our cohort, the significantly shorter duration of addiction among patients exhibiting impulsive behaviors and dual diagnoses (p = 0.003) is consistent with the notion that concurrent addictions might accelerate the clinical progression of GD and increase its overall disease burden (Grant et al., 2010; Grant & Chamberlain, 2014; Ford & Håkansson, 2020).

Accordingly, it is recommended that patients presenting with GD should be evaluated through a comprehensive clinical framework that extends beyond the primary behavioral addiction to include potential co-occurring alcohol and substance use disorders as well as the risk of parenterally transmitted infections associated with these conditions. Furthermore, the 4.82-fold higher likelihood of psychiatric comorbidity among individuals with serious physical illness (OR=4.82; p=0.027) suggests that the impact of GD may extend beyond mental health to broader aspects of overall health and functioning (Ford & Håkansson, 2020). Collectively, while taking the study's limitations into account, these findings emphasize the potential value of a multidisciplinary approach to the management of GD and strongly highlight the need for larger, multicenter, and longitudinal studies to validate and expand upon the present results.

Limitations

Several limitations of this study should be acknowledged:

The study utilized a single-center and retrospective design with data obtained from existing medical records, which introduces a potential risk of selection bias.

The very low positivity rates for viral markers (HBsAg: 0.6%, n=1; and anti-HCV: 0.6%, n=1), representing a "low event rate," may limit the statistical power of inferential analyses and potentially increase the risk of Type II error.

The accuracy of the variables is contingent upon patient self-reports and hospital records;

furthermore, data from a single center may limit the generalizability of the findings to populations in different geographic regions.

As the cohort comprised solely individuals diagnosed with GD, the findings may not be applicable to other forms of behavioral addictions.

Clinical details such as the severity and duration of the addiction, as well as relapse rates in behavioral addictions, could not be evaluated due to the retrospective nature of the data.

Although ELISA results were extracted from electronic health records, prior history of infections or follow-up for seroconversion was not performed.

CONCLUSION

This study indicated that the seroprevalence of HBV, HCV and HIV among individuals diagnosed with GD was generally low. HBsAg and anti-HCV positivity were each detected in 0.6% of participants (n=1), whereas no cases of anti-HIV

Our analyses further showed that individuals with psychiatric comorbidity were 12.38 times more likely to have an additional addiction (p=0.001). Moreover, the presence of a serious physical illness was associated with a 4.82-fold increased risk of psychiatric comorbidity (p=0.027), while younger age, being unmarried, and being childless were identified as significant correlates of additional addiction. Collectively, these findings suggest that individuals with behavioral addictions are characterized not only by addictive behaviors but also by complex biopsychosocial vulnerabilities.

In light of these findings, the adoption of a holistic and multidisciplinary approach to the evaluation of individuals with behavioral addictions appears warranted. In particular, among patients with psychiatric comorbidity and concurrent alcohol and/or substance use disorders, appropriate screening for HBV, HCV, and HIV may facilitate the early identification of occult infections, timely referral to preventive healthcare services, and improved access to vaccination programs, thereby providing important clinical and public health benefits.

Accordingly, increasing awareness of infectious diseases during psychiatric follow-up, implementing targeted screening strategies in high-risk populations, and integrating psychoeducation and interventions that promote preventive health behaviors into treatment programs may improve patient care. However, given the low event rate and the inherent limitations of the single-center retrospective design, larger multicenter prospective studies are needed to validate the present findings and enhance their generalizability.

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Conflict of Interest

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Ethical Declaration

Our study was approved by the Ankara Etlik City Hospital Ethics Committee (Ethics Committee Approval No: AEŞH-BADEK1-2025-297) and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants, and ethical principles regarding the confidentiality and privacy of the data were meticulously adhered to.

Authorship Contributions

Concept: EAM, Design: EAM, DK, AK, BK, Supervising: EAM, Financing and equipment: EAM, Data collection and entry: EAM, DK, Analysis and interpretation: EAM, Literature search: EAM, DK, AK, BK, Writing: EAM, DK, AK, BK, Critical review: EAM, DK, AK, BK.

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