



RESEARCH ARTICLE

Substance use patterns, psychosocial traumas, psychiatric comorbidities, and gender differences among adolescent inpatients at an addiction treatment center

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ABSTRACT

Objective: The aim of the present study was to determine sociodemographic and clinical characteristics, substance use patterns, psychosocial traumas, and gender differences among adolescent inpatients at an addiction treatment center.

Method: Participants were 105 adolescents consecutively admitted and hospitalized at the Children and Adolescent Alcohol and Drug Dependency Research Treatment and Training Center of Bakirkoy Prof Dr. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery between February and December 2017. Kiddie-Schedule for Affective Disorders and Schizophrenia, present and lifetime version, Hamilton Anxiety and Depression Rating Scales, Conners-Wells' Adolescent Self-Report Scale, Adolescent Dissociative Experiences Scale, Childhood Trauma Questionnaire, Addiction Profile Index-Practitioner Form, and Inventory of Parents and Peer Attachment were administered to all participants.

Results: Of all cases, 31.4% were girls. Criminal history, a diagnosis of conduct disorder, substance use in the family, emotional abuse, and heroin use were frequently revealed. Among the girls, the substance use period was shorter and ecstasy use, traumatic experiences, diagnosis of post-traumatic stress disorder (PTSD) and severity of comorbidities were prominent; among the boys, synthetic cannabinoid use was more prevalent. While synthetic cannabinoid and alcohol use were frequent among the cases with a diagnosis of attention deficit hyperactivity disorder, heroin use was prominent among cases with depression diagnosis and ecstasy use among cases with PTSD.

Conclusion: Among children and adolescents, substance use trends, childhood traumatic experiences, and severity of comorbidities may differ according to gender. It is important to take these differences into consideration in the treatment process.

Keywords: Adolescent, psychological trauma, substance abuse

INTRODUCTION

In a global perspective, addiction is seen to begin at an early age, and rates of substance use are higher among

younger users (1). In substance use disorder (SUD), particularly the risk of substance use in adolescence is known to be increased; therefore, prevention of smoking, alcohol consumption, and substance use

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during adolescence is of considerable importance (2). In Turkey, epidemiological studies as well as data regarding substance use in children and adolescents who have dropped out of education are very limited. A study by Ogel et al. (3) reported that 72% of children living on the street were using substances, mostly solvents (paint thinner), followed by marijuana and alcohol. Among the factors increasing the risk of substance use were academic failure, absenteeism, frequent changes in society, location, and environment, weak neighborhood connections, and economic deprivation (4).

The family environment is quite important in shaping a child's future behaviors. Accordingly, parents' alcohol or substance use, child neglect, a broken family, or the experience of fighting within the family are among the factors increasing the risk of substance use (4,5).

Coexistence of SUD and psychiatric diseases in adults is common and well documented. However, for children and adolescents, the number of population-based studies is low. Comorbidities can increase the substance-use risk in adolescence, and substance use may cause new psychiatric disorders such as cognitive disruptions or psychosis. Of the adolescents presenting at treatment centers for SUD, 60-80% show conduct disorder, 30-50% attention deficit hyperactivity disorder (ADHD), and 24-50% major depression. Depression, ADHD, and other disruptive conduct disorders as well as social phobia and general anxiety disorder in late adolescence are known to increase the SUD risk (6). It has been reported that adolescents displaying post-traumatic stress disorder (PTSD) initially try to treat themselves first with cigarettes, alcohol, and cocaine, and over time more commonly with heroin (7). Previous studies have shown persons with SUD to have experienced more frequent childhood abuse. In individuals with SUD with a history of childhood trauma, more psychiatric stress and comorbidity were found (8,9). Childhood sexual abuse most often causes depression, self-harm, suicide attempts, PTSD, SUD, borderline personality disorders and its characteristics, dissociative disorders, and a higher incidence of intravenous substance use, and may also lead to early smoking behavior. This situation has been claimed to arise from the attempt to cope with the trauma and overcome mood and emotional dysregulation. Childhood abuse can lead to loneliness, helplessness, a feeling that no one will come to one's help, and chaos, and the adolescent may turn to substance use in order to cope with these

problems (10). Negative childhood experiences can also affect attachment security, which again may predispose the adolescent to substance use (11). Individuals with secure attachment are more successful in creating social relations and have more trust in themselves and others; therefore, when under stress, they seek social support. If persons under stress turn to substances instead, their lack of this trait might be due to insecure attachment. A study in Turkey found adolescent substance users to be most frequently of the dismissive-avoidant type of the insecure attachment style (48%) (12).

The number of inpatient treatment centers for addicted children and adolescents in Turkey is very low. The evaluation of the patient population presenting to those few centers generates important and up-to-date data about substance use patterns and risk factors in the country. Aim of this study is to assess the sociodemographic and clinical characteristics, substance use patterns, and psychosocial traumas of the applicants at the inpatient unit of the Child and Adolescent Substance Abuse Treatment and Education Center (CEMATEM) and compare them by sex. Our hypothesis assumes substance use to be more severe in males than in females, while traumatic experiences and the number and severity of psychiatric comorbidities are expected to be greater in girls than in boys.

METHOD

Participants

The research was carried out with 105 consecutive patients under the age of 18 presenting at the CEMATEM of Bakirkoy Prof. Dr. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery in Bakirkoy (Istanbul, Turkey) between February and December 2017 who were hospitalized with a diagnosis of SUD. Excluded were patients with psychotic disorder, bipolar disorder in an active phase, or with a diagnosis of autism spectrum disorder, and persons with mental deficiency of a degree that prevented them from answering the questions in the clinical interview, illiterate patients, and individuals who did not agree to participate.

Procedure

After the researcher explained the purpose of the research and the tests to be administered, a voluntary consent form was received. Data regarding sociodemographic characteristics and substance use

were recorded in a sociodemographic data form prepared by the researchers. Psychiatric diagnoses were reviewed by the researcher using the Kiddie-Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime version (K-SADS-PL). Hamilton Anxiety and Depression Rating Scales and the Addiction Profile Index – practitioner form were administered. All participants were requested to complete the Conners-Wells Adolescent Self Report Scale, Childhood Trauma Questionnaire, the Adolescent Dissociative Experience Scale, and the Inventory of Parent and Peer Attachment. For this research, approval from the ethics committee of Prof. Dr. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery in Bakirkoy was received on February 2, 2017, decision no: 600.

Measures

Kiddie-Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime Version (K-SADS-PL): This semi-structured interview form was developed to measure past and present psychopathologies in children and adults according to DSM-IV diagnostic criteria (13). A validity and reliability study for the Turkish version was carried out by Gokler et al. (14).

Hamilton Depression Rating Scale (HAM-D): Developed by Hamilton, this scale is designed to measure the severity of depression (15). A validity and reliability study for the Turkish version was done by Akdemir et al. (16). It is also used in adolescents aged 12-18 (17).

Hamilton Anxiety Rating Scale (HAM-A): The HAM-A was developed by Hamilton to determine a person's anxiety level and symptom distribution. The validity and reliability in Turkish was studied in 1998 (18). The scale can also be used between the ages of 6 and 17 years (19).

Conners-Wells Adolescent Self Report Scale (CASS): The validity and reliability of the CASS (20), which is used to measure behavioral problems, in particular the severity of ADHD symptoms, for the Turkish version has been confirmed by Kaner et al. (21). The instrument consists of 6 subscales: family problems, emotional problems, conduct problems, cognitive problems/attention deficit, anger control problems, and hyperactivity. In addition, if required, 2 more sections can be used, the ADHD index developed on the basis of DSM-IV and the DSM-IV symptom subscale.

Childhood Trauma Questionnaire (CTQ-28): This instrument is a self-report form used to assess the existence of past emotional, physical, or sexual abuse and emotional or physical neglect and if existing, the severity of negative experiences (22). The short form contains 28 items. A validity and reliability study for the Turkish version has been done by Sar et al. (23).

Addiction Profile Index – Practitioner Form for Adolescents (API-A): The API-A is a self-report scale consisting of 37 questions and 5 subscales to be used in adolescents. This instrument was developed and its validity and reliability assessed by Ogel et al. (24).

Adolescent Dissociative Experience Scale (A-DES): This scale was developed to assess dissociative symptoms in children aged 11-17 years (25). The instrument was adapted to Turkish by Zoroglu et al. (26).

Inventory of Parent and Peer Attachment: This scale, developed by Armsden and Greenberg (27), determines if a person has a secure attachment pattern. Validity and reliability of the Turkish version have been studied by Gunaydin et al. (28).

Statistical Analysis

Statistical analysis was carried out using PASW version 18. Descriptive statistics were used to analyze sociodemographic data. For categorical characteristics, two-group distribution was measured with the chi-square test of independence. When comparing scale scores between two groups, for normally distributed variables independent-samples t-test and for non-normally distributed values Mann-Whitney U test were used. In comparing more than 2 groups, we used one-way ANOVA for normally distributed data and Kruskal-Wallis test for non-normally distributed values. A value of $p < 0.05$ was considered statistically significant. To avoid type I errors that may confound the measurement process, Bonferroni correction was performed in the Mann-Whitney U tests carried out to establish in which pair of groups the differentiations found to be significant by Kruskal-Wallis test had occurred. According to the Bonferroni correction, the significance level is divided by the number of groups to be compared; thus, a threshold value for significance of the comparisons of $p < 0.017$ was determined.

RESULTS

A total of 105 children and adults were enrolled in our study. Sociodemographic data are shown in Table 1. Mean age of male participants (17 ± 1.00) was

Table 1: Sociodemographic characters of the study group

	n (%)	
Sex		
Female	33 (31.4)	
Male	72 (68.6)	
Educational status		
Only literate	4 (3.8)	
Completed primary school	26 (24.8)	
Completed middle school	73 (69.5)	
High school graduate	2 (1.9)	
Family type		
Nuclear family	74 (70.5)	
Extended family	1 (0.9)	
Separated family	21 (20)	
In social care	9 (8.6)	
Migration background	64 (61)	
Previous legal issues	69 (65.7)	
Family members using psychoactive substances	59 (56.2)	
	Mean	SD
Age	1.07 (min: 13, max: 18)	
Female	16.9	1.13
Male	16.6	1.0
	17	

SD: Standard deviation

significantly higher than the females' mean age (16.6±1.13) ($t[103]=-2.581, p=0.011$).

The mean age at first substance use for all patients in the study was 12.8±1.5 years (minimum: 9, maximum: 15). To assess the existence of a difference between girls and boys in the continuous variables regarding substance use, independent-samples t-test was used for normally distributed data and Mann-Whitney U test for non-normally distributed values. Accordingly, mean age at first substance use in girls was 13.2±1.3 years and in boys 12.5±2 years. In our sample, 73.3% (n=77) had experienced life on the street. The number of nights spent on the street was higher in males (71.72±252 days) than in females (14.64±43.77 days) ($U=895, z=-2.047, p=0.041$). The total period of substance use was shorter in girls (1154±556 days) than in boys (1579±720 days) ($t[103]=-3.005, p=0.03$). The last use of substance was determined to be on average 37.58±74 days before admission in females and 10.53±17 days in males ($U=707.5, z=-3.342, p=0.001$). Though not statistically significant, the number of substances tried by boys was greater than in girls.

Multiple substance use was present in 34.3% of cases. Multiple drug use was higher in females (48.5%) than in males (27.8%) ($\chi^2=4.306, p=0.038$). The scores on the API-A subscale "impact on life" were higher in girls (9.09±2.0) than in boys (8.03±2.2) ($U=866, z=-2.245, p=0.025$).

The first substances used by our cases were inhalant/solvent (33.3%, n=35), cannabis (25.7%, n=27), synthetic cannabinoids (19% n=20), ecstasy (13.3%, n=14), heroin (6.7%, n=7), and cocaine (1.9%, n=2). The substance of choice in the study group was heroin (43.8%, n=46), synthetic cannabinoids (28.6%, n=30), and ecstasy (14.3%, n=15), followed by inhalant/solvent (4.8%, n=5), cannabis (2.9%, n=3), cocaine (2.9%, n=3), and methamphetamine (2.9%, n=3). Comparing the first substances used by sex, ecstasy as the first drug was significantly higher in girls ($p=0.001$, Fisher's exact test). Regarding the substance of choice, boys were significantly more likely to choose synthetic cannabinoids ($\chi^2=8.949, p=0.003$), while in girls the choice of ecstasy was significantly more prevalent ($p=0.005$, Fisher's exact test).

The most commonly seen type of psychosocial trauma in our sample was emotional neglect (34%), followed by physical abuse (33%). Of our cases, 28.6% (n=30) had been exposed to multiple psychosocial traumas. The mean number of traumatic experiences in females (1.61±1.3) was significantly higher than in males (0.86±1.0) ($U=793, z=-2.869, p=0.004$). Similarly, a history of sexual abuse was significantly more commonly seen in females than in males ($\chi^2=30.373, p<0.001$). The first sexual abuse happened after substance abuse in 9.5% of cases and before substance use in 6.7%.

The substance of choice of patients with a history of sexual abuse was ecstasy in 58.8% of cases (n=10) ($p=0.003$, Fisher's exact test), and 58.8% of participants with history of sexual abuse (n=10) were multiple substance users ($\chi^2=5.421, p=0.020$). The total CTQ-28 score and the emotional and sexual abuse subscores in girls were significantly higher than in males (Table 2).

The most commonly seen comorbidity was conduct disorder (78.1%, n=82), followed by ADHD (72.4%), major depression (61.9%), alcohol abuse (22.9%), oppositional defiant disorder (20%), and PTSTD (14.3%). Of all comorbidities, only PTSD was significantly higher in girls (39.4%) than in boys (2.8%) ($p<0.001$, Fisher's exact test).

In our sample, we found a self-harm rate of 60% (n=63). Self-injurious behavior was determined in

Table 2: Comparison of A-DES and CTQ-28 scores by sex

Instrument	Groups	Mean	SD	t	df	p
A-DES	Female	3.5	2.21	2.038	103	0.044
	Male	2.69	1.8			
CTQ-28	Female	48.36	19.45	791.5	-2.739	0.006
	Male	38.24	12			
-Emotional abuse	Female	10.52	5.13	757.5	-3.015	0.003
	Male	7.76	3.5			
-Physical abuse	Female	7.88	4.3	1133.5	-0.404	0.686
	Male	7.35	3.6			
-Physical neglect	Female	7.70	3.5	1086	-0.736	0.462
	Male	6.93	2.5			
-Emotional neglect	Female	11.76	5.4	1044.5	-0.995	0.320
	Male	10.61	5			
-Sexual abuse	Female	10.45	7.13	646	-4.642	<0.001
	Male	5.57	1.63			

A-DES: Adolescent Dissociative Experience Scale, CTQ-28: Childhood Trauma Questionnaire, SD: Standard deviation

69.7% of ADHD cases ($n=52$) ($\chi^2=10.870$, $p=0.001$). To identify a possible difference in CTQ-28 and A-DES scores of self-harmers and non-self-injurious participants, normally distributed data were evaluated with t-test, non-normally distributed values with Mann-Whitney U test. Accordingly, patients with self-injurious behavior scored significantly higher in the emotional abuse and physical neglect subscales of CTQ-28 ($U=971.500$, $z=-2.332$, $p=0.02$ and $U=1030$, $z=-2.002$, $p=0.045$). In cases with self-injurious behavior, the A-DES subscale absorption was found significantly higher ($t(103)=-2.023$, $p=0.046$). The age at first substance use was significantly lower in the cases with self-harming behavior compared to the non-self-injurious patients ($U=961.5$, $z=-2.238$, $p=0.025$).

HAM-D scores in girls were significantly higher than in boys ($U=831.5$, $z=-2.472$, $p=0.013$). In cases diagnosed with depression, emotional neglect was seen in 46.2% ($n=30$); in patients with no diagnosis of depression, the rate was 22.5% ($n=9$) ($\chi^2=5.934$, $p=0.015$). The substance of choice was heroin in 35.4% of depressive cases ($n=23$) ($\chi^2=4.920$, $p=0.027$). In our sample, 39% ($n=41$) had a history of suicide attempts. The rate of past suicide attempts in girls was 72.7% ($n=24$), significantly higher than in males (23.6%) ($\chi^2=22.936$, $p<0.001$). A history of suicide attempt was significantly elevated in cases diagnosed with depression (50.8%) ($\chi^2=9.850$, $p=0.002$).

In cases with ADHD, the substance of choice was synthetic cannabinoids (35.5%, $n=27$), but a

remarkable 81.6% ($n=62$) was using alcohol ($\chi^2=6.522$, $p=0.011$ and $\chi^2=4.404$, $p=0.036$, respectively). CASS scores for the subscales emotional problems, conduct problems, anger control problems, attention deficit, and impulsivity were higher in girls than in boys (Table 3).

In 86.7% of cases with PTSD ($n=13$), a history of sexual abuse was found ($p<0.001$, Fisher's exact test). A history of attempted suicide was reported by 80% of PTSD cases ($n=12$) ($\chi^2=12.331$, $p<0.001$). The most common substance of choice in the PTSD group was ecstasy (40%, $n=6$) ($p=0.007$, Fisher's exact test). To investigate differences in the scores of cases according to the presence of PTSD, normally distributed data were assessed by independent sample t-test, non-normally distributed values by Mann-Whitney U test. In the PTSD group, the insecurity scores on the attachment inventory were significantly lower ($p=0.034$), while their HAM-A and HAM-D scores, CTQ-28 total score and subscores for emotional abuse and sexual abuse were significantly higher ($p<0.001$, $p<0.001$, $p=0.001$, $p=0.002$, $p<0.001$, respectively). The differentiation of scores according to the presence of PTSD is shown in Table 4, the differences in CTQ-28 scores according to most common substances of choice in the study group are presented in Table 5.

Girls' HAM-A scores (9.48 ± 5.9) were significantly higher than boys' (6.22 ± 5.0) ($U=806$, $z=-2.643$, $p=0.008$). The A-DES scores also differed significantly between girls and boys (Table 2). The A-DES scores

were statistically significantly differentiated depending upon the substance of choice being synthetic cannabinoid, ecstasy, or heroin ($KWH_{(2)}=6.302$, $p=0.043$). According to Bonferroni-corrected Mann-Whitney U-test results used to establish which groups had created this difference, scores for patients whose substance of choice was ecstasy ($\bar{x}=60.43$) were higher than for participants with a preference for heroin ($\bar{x}=40.78$) ($U=200$, $z=-2.429$, $p<0.017$).

The attachment inventory scores were also significantly differentiated by the substance of choice being synthetic cannabinoid, ecstasy, or heroin ($KWH_{(2)}=6.091$, $p=0.048$). According to Bonferroni-corrected Mann-Whitney U-test results used to establish which groups had created this difference, scores for patients whose substance of choice was ecstasy ($\bar{x}=30.63$) were higher than for participants with a preference for heroin ($\bar{x}=30.63$) ($U=197.5$, $z=-2.472$, $p<0.017$).

DISCUSSION

Of the 105 adolescents in our study, 31% were female and 69% male. Being of the male sex is known to be a risk factor for SUD (29). While our study is consistent

with the literature, this may be related with the higher number of girls compared to boys among inpatients at the CEMATEM clinic.

A high number of cases were found to have psychoactive substance use in the family (56.2%). Apart from a genetic factor in families with psychoactive substance, deficient parenting and the frequent occurrence of neglect and abuse constitute a risk for the children to develop substance use. Epigenetic mechanisms are also thought to be involved (30).

An experience of life on the street was found in 73.3% of participants, which is consistent with findings from studies indicating that homelessness constitutes a risk for psychiatric patients to develop depression and SUD (31).

The rate of past suicide attempts in our study was high (39%), a situation frequently seen especially jointly with depression and PTSD. Some studies found a rate of 40% for attempted suicide in SUD. Comorbidities like depression, anxiety disorder, and PTSD have also been found to increase the risk for attempted suicide, alongside other factors such as impulsivity in SUD, bipolar affective disorder, a history of abuse, multiple substance use, cocaine use, and the presence of ADHD (32,33).

Table 3: Comparison of CASS subscale scores by sex

Instrument	Groups	Mean	SD	t	df	p
CASS-cognitive problems	Female	11.06	7.5	0.460	103	0.647
	Male	10.35	7.3			
CASS-emotional problems	Female	13.64	7.8	2.952	103	0.004
	Male	9.21	6.8			
CASS-conduct problems	Female	16.39	7.4	3.067	103	0.003
	Male	11.94	6.6			
CASS-anger control problems	Female	16.79	9.3	2.553	103	0.012
	Male	12.62	8.0			
CASS-hyperactivity problem	Female	9.82	4.9	1.971	103	0.051
	Male	7.75	5.0			
CASS-DSM-ADHD	Female	14.61	8.4	1.888	103	0.062
	Male	11.56	7.4			
CASS-DSM-attention deficit	Female	11.21	6.9	2.199	103	0.030
	Male	8.29	6.0			
CASS-DSM-impulsivity and hyperactivity	Female	10.48	6.5	2.783	103	0.006
	Male	7.01	5.6			
CASS-family problems	Female	12.06	9.6	908.5	-1.932	0.053
	Male	8.21	7			

CASS: Connors-Wells Adolescent Self Report Scale, SD: Standard deviation

Table 4: Comparison of A-DES, Inventory of Parents and Peer Attachment, CASS, HAM-A, HAM-D, CTQ-28, and API-A scores between cases with and without PTSD

	PTSD positive		PTSD negative		p value
	Mean	SD	Mean	SD	
A-DES	4.00	2.3	2.30	1.8	0.018 (t[103]=-2.397)
Attachment inventory	53.80	18.5	64.03	11.3	0.055 (t[15.807]=2.070)
-Trust subtype	18.20	8.5	23.01	5.2	0.034 (U=441, z=-2.118)
-Alienation subtype	18.73	6.8	21.38	4.9	0.072 (t[102]=1.818)
-Communication subtype	16.87	6.4	19.64	5.6	0.129 (U=504, z=-1.519)
CASS emotional	15.80	7.6	9.73	7.0	0.003 (t[103]=-3.057)
CASS conduct	16.27	6.3	12.86	7.2	0.088 (t[103]=-1.721)
CASS cognitive	13.60	7.8	10.07	7.2	0.085 (t[103]=-1.741)
CASS anger	18.93	9.2	12.81	8.2	0.010 (t[103]=-2.607)
CASS hyperactivity	11.47	5.8	7.89	4.7	0.011 (t[103]=-2.605)
CASS DSM ADHD	16.53	8.5	11.84	7.4	0.030 (t[103]=-2.200)
CASS attention deficit	13.13	6.7	8.50	6.2	0.010 (t[103]=-2.623)
CASS impulsivity	12.67	6.2	7.30	5.7	0.002 (t[103]=-3.258)
CASS family	13.80	11.1	8.69	7.3	0.118 (U=504.5, z=-1.564)
HAM-A	12.93	5.3	6.30	5.0	<0.001 (U=246, z=-3.938)
HAM-D	10.50	4.9	5.24	4.7	<0.001 (U=273, z=-3.698)
CTQ-28	55.20	20.7	39.12	13.2	0.001 (U=324, z=-3.217)
-Emotional abuse	12.27	5.6	8.02	3.7	0.002 (U=347, z=-3.047)
-Physical abuse	7.80	3.6	7.47	3.8	0.358 (U=581.5, z=-0.919)
-Physical neglect	7.93	4.2	7.04	2.7	0.663 (U=629.5, z=-0.435)
-Emotional neglect	12.47	6.4	10.72	5.0	0.395 (U=582.5, z=-0.851)
-Sexual abuse	14.60	7.7	5.86	1.4	<0.001 (U=198, z=-5.420)
API-A	7.69	1.4	7.00	2.4	0.097 (t[103]=-1.673)

A-DES: Adolescent Dissociative Experience Scale, API-A: Addiction Profile Index, CTQ: Childhood Trauma Questionnaire, CASS: Conners-Wells Adolescent Self Report Scale, HAM-A: Hamilton Anxiety Rating Scale, HAM-D: Hamilton Depression Rating Scale, PTSD: Post-Traumatic Stress Disorder, SD: Standard deviation

The total duration of substance use in girls was significantly shorter than in boys. Studies also emphasize that girls develop addiction faster than boys and progress more quickly (34). The result that females, whose state deteriorates more quickly, seek treatment faster than boys is to be expected. As a starter drug, our study more commonly found cannabis and lighter fuel, an inhalant/solvent. These substances are easy to obtain and cheap, and in addition, a popular, albeit false, belief suggesting that cannabis does not cause addiction may encourage its use (35). In girls, the use of ecstasy as a starter drug was significantly higher than in boys. While some studies did not find a sex-specific difference in ecstasy use or even found greater use in males (36), others reported more common ecstasy use in girls than in boys (37). A possible explanation might be the greater

trauma risk of girls and the choice of ecstasy as a means of self-medicating trauma-induced symptoms. Our patients' most common substances of choice were heroin and synthetic cannabinoids. Generally, studies with adolescents found marijuana and solvents to be used more frequently than heroin as the substance of choice (38,39). The frequent appearance of heroin use in our study may have been due to the fact that candidates for inpatient treatment are often heroin addicts applying for substitution therapy. The increasing choice of synthetic cannabinoids may also be related with its easy availability and low cost as well as with the increased use observed over the past years. In our study, males were significantly more likely than girls to choose synthetic cannabinoids. The literature indicates that the general user profile for synthetic cannabinoids is dominated by males in their 20s (40).

Table 5: Kruskal-Wallis test results for Childhood Trauma Questionnaire total and subscale scores by substance of choice in the study group

Instrument	Substance(s) of choice	Mean rank	df	χ^2	p	Groups with significant difference*
CTQ-28	Synthetic cannabinoid (30)	46.03	2	10.546	0.005	Ecstasy and heroin (U=152, p=0.001)
	Ecstasy (15)	65.20				
	Heroin (46)	39.72				
Emotional abuse	Synthetic cannabinoid (30)	46.28	2	8.651	0.013	Ecstasy and heroin (U=169, p=0.003)
	Ecstasy (15)	63.00				
	Heroin (46)	40.27				
Physical abuse	Synthetic cannabinoid (30)	47.22	2	0.194	0.908	
	Ecstasy (15)	43.77				
	Heroin (46)	45.93				
Physical neglect	Synthetic cannabinoid (30)	48.80	2	3.548	0.170	
	Ecstasy (15)	54.40				
	Heroin (46)	41.43				
Emotional neglect	Synthetic cannabinoid (30)	46.50	2	4.47	0.107	
	Ecstasy (15)	58.20				
	Heroin (46)	41.70				
Sexual abuse	Synthetic cannabinoid (30)	42.23	2	10.276	0.006	Ecstasy and heroin (U=203, p=0.005) Synthetic cannabinoid and ecstasy (U=122.5, p=0.005)
	Ecstasy (15)	62.30				
	Heroin (46)	43.14				

CTQ: Childhood Trauma Questionnaire, *: Bonferroni correction applied after Mann Whitney U test; p<0.017

Compared to preferential heroin users, patients choosing ecstasy were found to have higher CTQ-28 and A-DES scores and lower attachment inventory points. The incidence of sexual abuse was higher in ecstasy users than in patients not using that drug. Studies have pointed out that ecstasy increases serotonin release and causes euphoria, increasing interaction and communication but also the inclination towards certain sexual behaviors that may create situations involving the risk of sexual abuse, which is therefore frequently seen together with ecstasy use (41,42). As ecstasy increases the susceptibility for trauma, it may also increase the trauma-related risk of dissociation. One study observed distinctive dissociative symptoms and changes in body perception due to ecstasy that have also been seen in schizophrenia (42). The same study also compared the effect of ecstasy with the effects of cannabis and cocaine. Considering that our findings resulted from comparisons according to the most common substances of choice, from the perspective of generalizability it may be considered useful to repeat similar research with larger samples including users of other preferred psychoactive substances. We also need more work on attachment style in relation to substances of choice.

The number of sufferers from psychosocial trauma in our sample was high, which is in line with the literature (8,9). We found that in 9.5% of cases, the first sexual abuse happened after substance use. This is consistent with the high-risk hypothesis suggesting that substance use renders the adolescent more open and inclined towards risky and traumatic incidents (7). Emotional neglect and physical abuse were frequently found in our study. Previous studies with individuals suffering from SUD observed a high level of emotional neglect and sexual and physical abuse during childhood (8,43). In our research, the number of traumatic incidents in females was significantly greater than in males, in line with the literature, finding the rates of exposure to trauma in females with SUD (77-81%) higher than in males (54-69%) (44). CTQ-28 total score and scores for the CTQ-28 subscales emotional abuse and sexual abuse were higher in girls. Data in the literature regarding differences in emotional abuse by sex are fairly limited, leaving more need for research in this field. In our study, we found significantly more multiple substance use and especially ecstasy use in the group identified with sexual abuse. In victims of childhood sexual abuse, cigarette and substance use could be observed very early in adolescence; this situation is known to

arise in the attempt to cope with negative emotions and emotional imbalance created by the trauma (10). Some studies have postulated a relation between sexual abuse and subsequent cannabis and cocaine use (45), while others have emphasized the fact that particularly ecstasy impairs judgement and encourages risky sexual relationships (46).

As in the literature, conduct disorder was the most common psychiatric comorbidity in our SUD cases (6). In females, depression, the severity of ADHD, and anxiety and dissociation scores were higher than in males. The literature also reports that substance-addicted females more commonly suffer from psychiatric conditions (especially mood and anxiety disorder) than males (47,48). This may be the reason why females scored higher on the API-A scales measuring the effect of substance use on daily life.

In clinical samples, depressive disorders as comorbidities of SUD vary between 20 and 50%. The reasons for this frequent association may include joint neurobiological sensitivities and the self-treatment hypothesis (6,49). Depression was found in 61.9% of our patient population. The elevated rate in our study may be due to the selection of a sample of hospitalized patients rather than outpatients. In our study, the rate of emotional neglect was significantly higher in SUD cases with depression. Other studies also demonstrated that persons having experienced emotional neglect more frequently exhibited introjective disorders like depression, PTSD, and anxiety disorder (50). In our sample, depressive patients significantly more often chose heroin. In the general literature, we find a past history of major depression in 20-25% of heroin addicts and a current history of major depression in 15% (51).

The prevalence of ADHD in our study was 72.4%. Other research reported an ADHD history of close to 50% in SUD (6). The high SUD comorbidity in ADHD has been said to be related with impulsivity, social problems, less supportive families, genetic causes, and negative role modeling as well as with the adjustment of emotional dysfunction (52,53). CASS scores in girls were found to be higher than in boys. In what sense girls with ADHD differ from boys regarding substance use cannot be answered to any great extent from existing studies. Our finding might be explained with girls requiring more severe complaints of ADHD to develop SUD. In our research, individuals with ADHD used significantly more synthetic cannabinoids and alcohol as their substance of choice. Alcohol use is

known to start at an earlier age with ADHD. A study with adults found rates of alcohol use in persons with ADHD between 21 and 53% (54). Some persons with ADHD, even if they knew that cannabis damages cognitive and neurocognitive functions, reported to have achieved self-medication of their ADHD symptoms (52). A study published in 2017 found patients to have the impression that cannabis had a therapeutic effect on negative mood in ADHD (53). CASS scores were significantly higher in persons with self-injurious behavior than in persons not showing this behavior. Recent reviews have repeatedly confirmed ADHD to be a risk factor for self-harm and suicide. Apart from the ADHD components hyperactivity and impulsivity, comorbidities are also among the factors increasing the self-harming risk (55).

In the literature, the PTSD rates in girls with SUD are higher than in males (44), matching our study results. In the PTSD group, past sexual abuse is significantly prevalent. The CTQ-18 subscores for sexual and emotional abuse are also found to be increased. Sexual abuse during childhood has been shown to be related with PTSD in adolescence (10). Considering the high emotional abuse scores, other types of abuse might also be related with the development of PTSD. In our study, the most common substance of choice in the PTSD group was ecstasy. In the literature, different indications for substance choice in PTSD can be found. Some studies found common use of opioids in the PTSD group, suggesting that this situation might be related with the dysregulation of the opioid system in PTSD and an attempt at self-medication, while other studies did not find such a relation (56). Evidently, this area is in need of further study. Attachment in the PTSD group is more insecure. Studies have reported secure attachment to be related with low PTSD symptoms (57). ADHD scale scores were also higher in the PTSD group. The common comorbidity of ADHD and PTSD found in these studies seems remarkable. The relation between these two diagnoses might be considered bidirectional. As risk-taking behavior and impulsivity are greater in ADHD, the affected individuals are more exposed to traumatic events. At the same time, similar genetic and environmental risk factors shared by these two diagnoses increases their association (54). In addition, traumas create changes in the neural pathways that affect cognitive processes causing ADHD such as executive functions, working memory, emotional and impulse control, and the

inhibitory network, and they increase the disposition towards ADHD symptoms. Indeed, sometimes overlapping or coinciding symptoms may confound the diagnoses of PTSD and ADHD (58). A-DES scores in the PTSD group were significantly elevated. Previous studies also found dissociation scale scores in PTSD quite high, which shows the importance of adding a dissociative subtype to PTSD in the DSM-5 (59).

In cases displaying self-injurious behavior, A-DES scores were increased as well. Studies in adolescents also found more common self-injurious behavior in dissociative cases and identified a high level of dissociation as an independent risk factor for self-harming (60). Self-harming cases are found to start substance use younger; emotional abuse and physical neglect are often encountered. In the literature, self-injurious behavior has been determined as an independent risk factor for addiction (61). Other studies reported self-harming to be related to childhood traumas, determining a correlation especially with sexual and emotional abuse and physical neglect (62).

There was a highly relevant difference in the numbers of girls and boys enrolled in the study due to the greater bed capacity in the male ward of CEMATEM. This should be kept in mind when interpreting the sex differences in our study. Another limitation was the absence of a control group of normal healthy youths. Furthermore, the results may have been affected by the retrospective anamnesis of symptoms regarding comorbidities and traumas and the failure to carry out family interviews; trauma-related dissociative symptoms may have impacted on the results, too. It is also important to consider that the study was done with adolescents presenting to our treatment center and being hospitalized of their own accord, which is not representative for the general population. In addition, the evaluation of score differences according to substance of choice was based on the most commonly preferred substances in the study group, which does not represent the general population, but still offers important insights. It will be useful to repeat this research with a larger sample including users of other psychoactive substances of choice.

In our study, we have tried to examine the sociodemographic and clinical characteristics and substance use patterns of adolescents hospitalized at an inpatient center for substance addicts and to compare them by sex. A family history of alcohol and substance use, a history of multiple trauma and

emotional neglect, criminal history, conduct disorder and a diagnosis of ADHD are encountered very frequently. In girls, despite a shorter duration of substance use, we found more multiple substance use, a more extensive history of traumatic experiences and sexual abuse, PTSD diagnoses and greater severity of psychiatric diseases. While synthetic cannabinoids were dominant as the substance of choice in boys, ecstasy was dominant in girls. Depressive adolescents tended more to choose heroin, whereas synthetic cannabinoid and alcohol use were more commonly found in adolescents with ADHD and ecstasy use in participants with comorbid PTSD. These results demonstrated that substance use patterns may vary according to sex as well as in relation to comorbidities. It is therefore of great importance to take these aspects into consideration when planning the treatment process. Considering the increasing incidence of substance use in children and adolescents, we realize the need for more studies in this area with bigger samples.

Contribution Categories		Author Initials
Category 1	Concept/Design	D.Y., O.Y., A.C.
	Data acquisition	D.Y., O.Y., A.C.
	Data analysis/Interpretation	D.Y., O.Y.
Category 2	Drafting manuscript	D.Y., O.Y., A.C.
	Critical revision of manuscript	D.Y., O.Y.
Category 3	Final approval and accountability	D.Y., O.Y., A.C.
Other	Technical or material support	N/A
	Supervision	O.Y.

Ethics Committee Approval: For this study, approval from the ethics committee of Prof. Dr. Mazhar Osman Training and Research Hospital for Psychiatry, Neurology, and Neurosurgery in Bakirkoy was received on February 2, 2017, decision no. 600. Our research is in conformity with all ethical principles laid out in the Declaration of Helsinki from 1964 and later amendments.

Informed Consent: Verbal and written consent was obtained from all patients.

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