




# Clinical and Background Risk Factors Affecting Dropouts from Alcohol Use Disorder Treatment: a 25-Year Retrospective Study

Ivica Mladenovic<sup>1</sup> · Ivana Perunicic-Mladenovic<sup>1,2</sup>  · Ivan Dimitrijevic<sup>3,4</sup>

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## Abstract

This study analyses variables as predictors for both positive outcomes and dropout in undergoing inpatient treatment for alcohol use disorder (AUD). Retrospective in nature, it analyses patient treatment evaluations spanning a 25-year timeframe with a 5-year follow-up on positive outcomes. The sample consists of 820 inpatients who underwent AUD treatment. A set of 30 grouped variables was applied: socio-demographic data, clinical characteristics and therapy characteristics. Seventy-one percent successfully completed treatment. Six variables were defined as predictors of treatment outcome: education-level attained, employment, duration of alcohol dependence, abstinence upon admission to hospital, sponsor presence and use of disulfiram in treatment. The presence of sponsors and disulfiram in treatment are all net positives to successful treatment outcomes. Moreover, patients who have not achieved a minimum secondary school education are unemployed or at the onset of their alcohol addiction may require particular attention due to their higher risk of dropping out.

**Keywords** Alcohol use disorder · Treatment evaluation · Positive treatment outcomes · Dropouts · Socio-demographic factors · Clinical predictors

Alcoholism is an ongoing, serious global issue (Carvalho et al., 2019). The World Health Organization (WHO) estimates that 2.6% of the world's population over the age of 15 regularly abuses alcohol (WHO, 2018), with 15–40% of the general global adult population engaging in harmful drinking (Kuntsche et al., 2017). Exacerbating the social costs is the associated ones which also drain on public resources (Laramée et al., 2013). Complicating matters in fighting against alcoholism is that treating alcohol use disorder (AUD) is extremely complex (Sliedrecht et al., 2019). Given these specific factors affecting public

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✉ Ivana Perunicic-Mladenovic  
ivanaperunicicmladenovic@gmail.com

<sup>1</sup> Institute of Mental Health, Milana Kašanina 3, Belgrade 11000, Serbia

<sup>2</sup> University of Belgrade, Faculty of Philosophy, Department of Psychology, Belgrade, Serbia

<sup>3</sup> Clinic for Psychiatry, Clinical Centre of Serbia, Belgrade, Serbia

<sup>4</sup> University of Belgrade, Faculty of Medicine, Belgrade, Serbia

health as well as limitations for treatment, gaining better cognition of what predictors most affect treatment outcomes is crucial to the therapeutic process in order to ensure that those who struggle with alcoholism are better able to proceed successfully through therapy.

Given the background as a public health issue difficult to treat, this study is designed to establish factors to better predict positive outcomes as well as dropouts of intensive hospitalised treatment of AUD. Doing so is essential to illuminate the risk factors for voluntary early cessation of treatment that may otherwise have hitherto not received due attention as dropout factors. Although the literature is replete with predictors, the predictive factors examined either are separately or are too specific. Therefore, our study seeks to create a set of robust factors derived from patient samples collected during 25 years of clinical practice.

## Positive and Negative Outcome Predictors in Treating AUD

Factors in predicting whether a patient shall be able to successfully undergo treatment for AUD vary. The literature offers a variety of indicative factors on those who are more likely to be successful when undergoing AUD treatment as well as determining factors for an increased risk of dropping out (Aguir et al., 2012).

There are a number of established socio-demographic characteristics that are factors in successful AUD treatment (Hansen et al., 2020). Being in a state of matrimony is a positive factor (Murphy & Turgoose, 2019). One's gender may lead to higher completion rates with men being more likely to be diagnosed with AUD (Boschloo et al., 2012) and women being less likely to seek treatment (García-Marchena et al., 2023). Employment is a critical factor as wishing to retain one's job may act as an incentive for those who are already employed (Henkel, 2011). An indicated family history of exposure to alcohol abuse from family members to minors is also a factor in predicting remission and relapse (Koenig et al., 2020).

Beyond the socio- or economic factors, clinical features of treatment also play an important determinant (Hansen et al., 2020). Early contact with alcohol as well as long-term abuse is found to have a negative impact (Das et al., 2020). Moreover, the presence of any psychiatric comorbidity may also actively interfere in positive treatment outcomes (Kelly et al., 2012).

## Approaches to Treatment of AUD

Theoretical approach also affects treatment outcome (Nyhuis et al., 2018), such as combining psychotherapy and psychopharmacotherapy leading to the best outcomes (Ray et al., 2020) with the administration of disulfiram found to be highly effective (Mutschler et al., 2011). Studies suggest group psychotherapy to be the "method of choice" in treating AUD (Lo Coco et al., 2019); more specifically, group and family therapy based on a systems approach has been demonstrated to be beneficial in treating addictions due to its comprehensiveness (Komashie et al. 2021; Savic et al. 2017).

The therapeutic approach specific to treatment for this study is based on the systems theory which defocuses the etiology of the disorder from the individual to the environment (predominantly in the family) that has a significant role in developing disorders (McCrary, 1989; Steinglass, 2009). The *Systemic Therapy of AUD* (STA) is based on systemic family

therapy in treating alcoholism under controlled hospital conditions which is evaluated in our study by assessing predictors of both successful completion and dropouts.

Given these clinical and background factors, this study aims to find significant and robust factors (i.e. clinical characteristics of treatment as well as socio-demographic patient background) that may inform on the positive outcome of AUD treatment through a comprehensive evaluation of inpatient treatment for AUD, comparing dropouts to positive treatment outcomes. We have, in our study, tried to unify factors that are relatively ready to assess in order to assemble a composite of significant variables which clinicians may use at the onset of treatment in order to better determine dropout risks and directly intervene with such patients.

## Material and Methods

### Present Study

As a retroactive study, data was collected on patients who underwent inpatient treatment for AUD from 1987 to 2012 at the Clinic for Substance Abuse of the Institute of Mental Health (Belgrade, Serbia) to create a sample for further analysis against available assigned variables. All inpatients spanning from this timeframe were included in the sample as per the criteria for their hospitalisation. All patients who successfully completed their inpatient treatment were subjected to a follow-up of 5 years to assess their capacity to remain abstinent.

Given the expansive data sample size covering 25 years, an analysis was conducted for every fifth year within this given timeframe (i.e. 1987, 1992, 1997, 2002, 2007 and 2012) which amounts to a total of 820 patients. Our predictors were both robust and non-time sensitive as the score of predictors were based on six time points over a 25-year period. Apart from 1987, in which the 9th Revision of the International Classification of Diseases and Related Health Problems (ICD-9) was applied (WHO, 1977), the ICD 10th revision (ICD-10) (WHO, 1992) was used to diagnose alcohol dependence and other present psychopathology. Nevertheless, there are no differences in the diagnosing criteria for AUD between these two ICD classifications.

### Sample

A total of 820 alcohol-dependent patients were hospitalised within these given years. The inclusion criteria are diagnosed AUD (with or without comorbidities) and over 18 years of age. The exclusion criteria were the presence of any primary psychiatric disorders conjoined with alcohol abuse and severe psychoorganic syndrome (note: these are also the indications and contraindications by the STA for inpatient treatment). The sample consists of 165 (20.1%) women and 655 (79.9%) men. While the sample age ranged from 18 to 73, its mean was 42.14 (SD = 9.83).

### Variables

A positive outcome was measured as full completion of inpatient treatment (i.e. all phases of treatment) after which the medical board deemed the patient to have successfully

completed the programme. These patients were then released into outpatient care who then regularly screened the patients. Those who remained consistently abstinent for 1 year following their inpatient treatment were screened at random intervals over the subsequent 4 years.

This research uses three sets of independent variables of ten variables each (30 variables in total); these variables were present in all patients' medical records as standard procedure:

1. *Socio-demographic data*: gender, age, birth order, level of education attained, employment, housing independence, history of legal problems, marital status, length of marriage, number of children, family composition, academic performance in secondary school and presence of alcoholism in the family.
2. *Clinical features*: drinking habits, initial contact with alcohol, duration of AUD, decline of alcohol tolerance, alcoholic amnesia ("blackouts"), alcohol type preferred, total duration of abstinence achieved upon admission to hospital, somatic comorbidity (chronic diseases), neuropsychiatric comorbidity and presence of any additional addictions.
3. *Characteristics of the therapeutic process*: duration of inpatient treatment, presence of withdrawal syndrome upon admission, detoxification on admission, professional consequences of alcoholism as motive for treatment, number of previous treatments undertaken, presence of sponsors in treatment and use of disulfiram.

These independent variables present the potential prognostic factors (predictors) of successful treatment outcomes defined through the dependent variable *outcome of hospital treatment*. According to the STA, the primary endpoint of hospital treatment is completed inpatient treatment, with any cessation of treatment considered to be a failure (i.e. dropout).

Hospital treatment consists of planned 24-h-a-day inpatient treatment. Patients attended daily group therapy with attending sponsors also participating every day permitting for occasional sponsor absences. Based on STA, intensive treatment requires approximately 8 weeks. The therapeutic model also incorporates pharmacotherapy together with a number of significant cognitive-behavioural therapy techniques. The treatment itself is divided into three phases: (Aguiar et al., 2012) psychoeducational ending with an exam in AUD (2 to 3 weeks), (Boschloo et al., 2012) self-insight into alcohol dependence and its consequences (4 weeks) and (Brorson et al., 2013) planning the future and analysis of the therapeutic process (2 weeks). Following their successful completion of the inpatient programme, patients were transferred to the outpatient programme which consisted of 1 year of one-on-one counselling with a psychiatrist under the same state care structure on a regular basis.

## Statistical Analysis

Using descriptive (absolute and relative numbers ( $N$ ), %, measuring central tendency and variability) as well as analytical statistical methods (difference and correlation analysis), this study employs parametric ( $t$  test) and nonparametric (Chi-square test, Chi-square, Mann-Whitney  $U$  test) tests to analyse parameters of positive outcomes and dropouts. To analyse correlation, a multivariate binary logistic regression was used whereby the dependent variable was hospitalisation outcome in conjunction with two values: (1) *hospital treatment not completed* and (2) *hospital treatment completed*. Independent variables in the model were those which had proved their significance for treatment outcome in the

univariate analysis. The data were processed using the SPSS 20.0 software package (IBM Corporation). All  $p$  values lower than 0.05 were considered to be significant.

## Results

### Socio-demographic Predictors of Positive Treatment Outcome vs. Dropout

Of the total number of alcohol-dependent inpatients admitted to hospital ( $N = 820$ ), 582 (71%) completed their STA, while 238 (29%) dropped out. Table 1 lays out the most important socio-demographic variables affecting treatment outcomes. Age was a significant factor in the outcome of treatment ( $t = 2.242$ ,  $p < 0.05$ ). Dropouts were generally younger ( $M = 40.84$ ,  $SD = 10.48$ ) against those completing inpatient treatment ( $M = 42.55$ ,  $SD = 9.66$ ). The largest dropout was among those up to 29 years of age (42.0%), contrasted against those 50 to 59 years of age where the dropout rate was lowest (24.3%).

From those who successfully completed STA, 28.4% experienced a relapse within 6 months; 71.6% remained abstinent for 2 years and 19.4% for 5 years following original successful completion of inpatient treatment.

As dropout rates decreased in relation to previous education achieved, education itself was found to be an important variable. *Having completed one's secondary school*

**Table 1** Socio-demographic variables influencing STA outcome

Variable	N	Treatment outcome (%)		Chi-square	df	p
		Not completed	Completed			
<i>Age</i>				10.455	4	0.034
< 29	88	42.0	58.0			
30–39	240	30.8	69.2			
40–49	306	26.1	73.9			
50–59	148	24.3	75.7			
> 60	37	29.7	70.3			
<i>Education</i>				15.031	3	0.002
Primary	176	37.5	62.5			
Incomplete secondary	179	29.1	70.9			
Complete secondary	286	30.1	69.9			
Higher education (some tertiary or above)	179	19.0	81.0			
<i>Employment</i>				10.728	1	0.001
Employed	606	25.7	74.3			
Unemployed	210	37.6	62.4			
<i>Housing independence</i>				6.565	1	0.010
Independent	574	26.5	73.5			
Dependent	243	35.4	64.6			
<i>Criminal history</i>				5.023	1	0.025
No	760	28.0	72.0			
Yes	60	41.7	58.3			

*education* was a clear factor in determining dropouts ( $X^2 = 15.633$ ;  $p < 0.05$ ). *Employment* was also a significant variable because dropouts were higher among the unemployed (37.6%) than the employed (25.7%). Although it may be a local determinant, the patient sample had a slightly higher representation of those employed through state-sector jobs (74.8%) than the private sector (69.8%). Based on *housing dependence*, the dropout rate was lower for patients domiciled in their own residence (26.5%) compared to those domiciled with their parents/family. Dropout was also higher among those reporting to be financially dependent on family as well (35.4%). *Criminal history* was found to be a factor predicting higher dropout (41.7%) in comparison to those without (28.0%).

A *history of familial alcohol abuse* was not a significant factor distinguishing the two comparable groups, bearing no determinable effect on hospitalisation outcomes from the sample ( $p = 0.950$ ).

All other socio-demographic variables were found to have no statistical significance in relation to their influence on the outcome of STA.

### Clinical Features of Positive Treatment Outcome vs. Dropout

Table 2 presents the significant patient variables affecting treatment outcome. *Early contact with alcohol* (> 7 years of age) led to a higher dropout rate (41.7%), thereby sequentially decreasing and tapering to 23.8% for those who engaged in drinking only after 30 (significant linear correlation  $p < 0.05$ ). Nonetheless, the following variables were not established to be of importance for the STA outcome ( $p = 0.173$ ): drinking habits, decline of alcohol tolerance, alcoholic amnesia (“blackouts”), alcohol type preferred, somatic comorbidity (chronic diseases), neuropsychiatric comorbidity and presence of any additional addictions.

The greatest risk for dropping out which significantly affected positive outcomes was among patients who had reported to have a history of alcohol *dependence* in duration of up to 5 years (41.3%) prior to seeking treatment.

**Table 2** Clinical factors influencing treatment outcomes

Variable	N	Treatment outcome (%)		Chi-square	df	p
		Not completed	Completed			
<i>Duration of alcohol dependence</i>				12.119	3	0.007
Up to 5 years	126	41.3	58.7			
5–10	242	26.9	73.1			
10–20	321	25.2	74.8			
> 20	124	30.6	69.4			
<i>Duration of abstinence on admission to hospital</i>				8.651	2	0.013
Non-abstinence	184	34.8	65.2			
1–7 days	402	30.6	69.4			
> 7 days	230	22.2	77.8			

Confirmed by a significant linear correlation ( $p < 0.005$ ), *duration of abstinence on admission to hospital* was also an important variable as longer the abstinence on admission was matched by a greater likelihood of a positive outcome.

### Characteristics of the Therapeutic Process Affecting Treatment Outcome

The average *treatment duration* for those completing STA was 55.5 days (SD = 21.68), while it was 19 days (SD = 18.67) for those who dropped out. The difference in the duration of treatment between these two groups was statistically significant ( $t = 17.650$ ;  $p < 0.001$ ).

Alcohol dependent patients admitted *to the hospital for the first time* were more likely to drop out (30.7%) compared to patients treated for a second time or more (25.2%). However, this difference was not found to be significant on final treatment outcomes ( $p = 0.110$ ).

Table 3 shows that *seeking treatment as a means to retain employment* significantly affects treatment outcome ( $p = 0.001$ ). Most dropouts were those who had been motivated to seek treatment by their family (35.1%). The importance of sponsors in treatment in relation to outcome was confirmed by the dropout rate in patients who had sponsors (27.7%) being significantly lower than in those who had none (41.9%). Among sponsor patients, those who had a workplace peer as a sponsor successfully completed treatment (91.2%). Parents as sponsors, in contrast, led to the lowest completion of treatment (65.7%). The application of *aversive therapy (disulfiram)* proved to be an essential factor in positive outcomes: the dropout rate for those receiving disulfiram was 20.2%, in stark contrast to those who did not (59.1%).

### Robust Predictors of Treatment Outcome

Applying the *binary logistic regression model* to the ten significant variables obtained by the univariate statistics, six variables stood out (Table 4) thereafter defined as *STA outcome predictors for hospitalised alcohol-dependent patients* (Nagelkerke  $R$  Square = 0.243).

Of the socio-demographic variables, the outcome of hospital treatment was significantly affected by the characteristics of the patient's *education* and *employment*. Among clinical

**Table 3** Therapeutic factors affecting treatment outcomes

Variable	N	Treatment outcome (%)		Chi-square	df	p
		Not completed	Completed			
<i>Seeking treatment to retain employment</i>				10.337	1	0.001
Yes	188	19.7	80.3			
No	632	31.8	68.2			
<i>Sponsor present in treatment</i>				6.538	1	0.011
Present	746	27.7	72.3			
Not present	74	41.9	58.1			
<i>Disulfiram present in therapy</i>				105.911	1	0.001
Yes	634	20.2	79.8			
No	186	59.1	40.9			

**Table 4** STA outcome predictors for hospitalised alcohol-dependent patients (defined by the binary logistic regression model)

Variable	B	S. E.	Wald	p	OR	95% CI for OR	
						Lower	Upper
Age group	.097	.109	.798	.372	1,102	.891	1,363
Education	.179	.063	8,081	<b>.004</b>	1.196	1.057	1.352
Employment	.503	.202	6,198	<b>.013</b>	1,654	1.113	2.458
Housing independence	.253	.209	1.470	.225	1.288	.855	1.940
Criminal history	-.525	.316	2.771	.096	.591	.319	1.098
Duration of alcohol dependence	.225	.111	4,092	<b>.043</b>	1.252	1.007	1.556
Duration of abstinence on admission to hospital	.402	.125	10,333	<b>.001</b>	1.496	1.170	1.911
Seeking treatment as means to prevent job loss	.310	.234	1.766	.184	1.364	.863	2.155
Presence of sponsor	.687	.285	5.834	<b>.016</b>	1.988	1.138	3.473
Disulfiram therapy	1.807	.195	86.118	<b>.000</b>	6.094	4.161	8.927

features, *duration of alcohol dependence* and *duration of abstinence upon admission to hospital* most determined a positive outcome. For the therapeutic process itself, the results of treatment were significantly influenced by the *presence of a sponsor* and *disulfiram in treatment*.

## Discussion

Seventy-one percent successfully completed STA, which is significant in view of the treatment's complexity and its average total length (55 days). Of these, 71.6% continued to regularly attend outpatient treatment without entering relapse within the first 2 years following hospitalisation. In stark contrast is the 19-day average duration of treatment among dropouts (29% of the total sample), which coincides with completion of only the psychoeducational phase and not with the patient's examination of their AUD or changing their dysfunctional patterns of behaviour. Accordingly, this timing of average dropout points to their first stabilising but abandoning any arduous, long-lasting treatment that would require deeper psychological change.

By analysing the data obtained, a model to predict outcomes of treatment was created based on six variables that significantly influence the outcomes of inpatient treatment of AUD patients (i.e. *predictors of treatment outcome*): (1) education, (2) employment, (3) duration of alcohol dependence, (4) duration of abstinence upon admission to hospital, (5) presence of sponsor in treatment and (6) application of disulfiram during treatment.

*Education attained* is an important predictor in positive treatment outcome, as there is a clear linear correlation in the likelihood to drop out and lower education. While anyone may grow to become alcohol dependent regardless of education attained, research does suggest education serves a protective role against alcoholism (Grant et al., 2012). Conversely, higher education may also reduce motivation to seek treatment due to increased awareness of social stigma (Schuler et al., 2015). Even so, education itself is a factor of distinction in the therapeutic process (Brorson et al., 2013). It would appear that the higher educated the patient is, the more likely they are to possess personality traits that will allow



them to recognise their AUD and take steps to resolve it. The less educated a patient is, the less likely they are to have the same traits to resolve their AUD (Sawayama et al., 2012).

*Employment* was an important factor for positive patient outcomes. Fearing the loss of employment is associated with being capable of perceiving threats to oneself; in the context of treatment, this same fear allows the patient to recognise self-harm and potential threats from AUD which may also push the patient to seek and complete treatment (López-Gofiñ et al., 2012; Piontek et al., 2017). Our study's results indicate that employed AUD patients are less likely to drop out than those who are unemployed. Potential loss of employment may also act as an incentive to complete treatment.

*Duration of alcohol dependence* is a predictor of treatment outcome ( $p = 0.043$ ). Patients who completed treatment were more likely to report a dependence duration of 10 to 20 years (74.8%), in contrast to those who had a duration of > 5 years (58.7%). Shorter duration of AUD may not provide the patient with enough time to accept their dependence as well as not give a history of negative addiction impact to act as an incentive to complete treatment (Aguilar et al., 2012; Elbreder et al., 2011; Ray et al., 2017).

*The duration of alcohol abstinence on admission to hospital* as a predictor indicates that the longer the abstinence, the higher the chances of treatment success. The largest dropout rate was among patients who reported to have not abstained from alcohol on admission to hospital (34.8%). The negative outcomes of non-abstinent patients may be attributed to their inability to handle withdrawal and seeking admission to treatment as a way to stabilise. These patients may report the need to "take a break from drinking" but are not interested in treatment (Nguyen et al., 2020; Preuss et al., 2012). This predictor may act as a *modulator of treatment outcome* to be implemented at the triage stage of inpatient admission to treatment.

The significance of the predictor *inclusion of sponsors in the therapeutic process* to treatment outcome was confirmed by its binary logistic regression. Treatment outcome was not only significantly affected by the presence of a sponsor but was further affected by relationship type of the sponsor to the patient: lowest in parents (65.7%) and highest among work peers (91.2%). This disparity may be attributed to fear of family stigmatisation as well as tolerance of parents to their children, whereas professional relationships may show minimal tolerance (McCann & Lubman, 2018; McCrady et al., 2018). Outcomes proved to be worse when patients had no sponsor (58.1%), aligning with results in the literature (Hunter-Reel et al., 2012; O'Farrell & Clements, 2012).

As with Elbreder et al. (2010), *the use of disulfiram* proved to be the most significant predictor. Although regularly used, disulfiram remains controversial in treatment, with Ulrichsen et al. (2010) questioning its efficacy and benefits to its use cannot be determined in blind studies. Even so, research points to the efficacy of disulfiram in the prevention of relapse when taken under supervision of another in the patient's environment (Skinner et al., 2014).

A possible recommendation that may be concluded from the results is that hospitalised treatment based on STA with the inclusion of disulfiram in therapy as well as the presence of cosponsors would lead to an increased positive health outcomes among those who are employed and educated as well as among those who have a reported history of alcohol dependence longer than 5 years in duration.

A further use of the results obtained herein would be more attention paid to certain patient groups or who share common factors: the unemployed, the lower educated, those who report less than 5 years of alcohol dependence and those who are unable to achieve abstinence prior to admission to the hospital. Patients high in these factors are more at risk of dropping out of treatment, possibly due to a distinct lack of motivation (i.e. not

fearing loss of employment, demonstrated inability to commit as in education or have yet to feel the tangible effects of longer-term alcohol addiction) and deserve attention aimed at increasing their motivation to complete the treatment. This study, therefore, may serve as a foundation for other studies to investigate strategies to increase motivation to decrease dropout rates in AUD treatment under patients facing these factors.

## Limitations

One strength of this study is that it is able to analyse for predictors of successful treatment outcome for AUD across disparate societal changes due to the overall length of the data collected. This study examined AUD. Both positive and risk factors should be approached with caution if applying to other additions.

## Conclusions

A total of 71% of the sample were successful in completing their inpatient AUD treatment. Through this retrospective study, a total of 30 well-established variables were tested for their predictive potential of positive outcomes vs. dropout in AUD inpatient treatment. Only six predictors were found to be significantly indicative of positive treatment outcome: education, employment, duration of dependence, duration of abstinence upon admission, presence of sponsor and use of disulfiram in therapy.

Education, employment and duration of dependence cannot be changed, while duration of abstinence on admission to hospital, existence of sponsor in treatment and application of disulfiram are one which clinicians may influence and are therefore predictors, as well as modulators of positive treatment outcome.

Not achieving a higher education (less than secondary school or lower), unemployment and being at the onset of their alcohol dependence are all predictors that clinicians should pay particular attention to as these patients are all at a higher risk of dropping out.

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**Data Availability** Supporting the open science, our data may be found at [https://osf.io/5jghb/?view\\_only=4652638f28ca4f138cd6e909e8d2a29f](https://osf.io/5jghb/?view_only=4652638f28ca4f138cd6e909e8d2a29f).

## Declarations

**Ethical Approval** Owing to its nature as a retrospective study, the study strictly adheres to the recommendations on the privacy of participants and was also approved by the Ethics Committee of the Institute of Mental Health and the Ethics Committee of the Faculty of Medicine (Belgrade University, Serbia).

**Conflict of Interest** The authors declare no competing interests.

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