

# Adult ADHD symptoms in a group of patients with substance abuse

## *Sintomi dell'ADHD nell'adulto in un gruppo di pazienti con abuso di sostanze*

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**SUMMARY. Background.** Attention Deficit Hyperactivity Disorder (ADHD) has a high degree of heritability and recently has become a challenge not only for clinicians evaluating children and adolescents but also for adult psychiatrists. The latest studies and diagnostic manuals show that the ADHD symptoms are not "overgrown" in adulthood, the way they are expressed merely changes. **Methods.** The present study investigates the presence of ADHD symptoms in a group of 104 adult patients admitted to psychiatric services, with chronic substance abuse. The subjects selected for the study were evaluated using the DIVA 2.0 instrument, a scale designed to diagnose ADHD in adulthood. **Results.** The study results showed that 46% of the drug users, included in the study, have specific symptoms that can be diagnosed as ADHD in adults. Of the 54 subjects who met ADHD criteria in childhood, only 6 did not meet these criteria in adult life, resulting in 89% of ADHD patients maintaining symptoms in adulthood, causing dysfunction in certain life areas. **Conclusions.** The presence of ADHD diagnosis in the selected group, has been shown to increase the vulnerability of up to twice the chronic consumption of psychostimulants, an observation of great therapeutic and prophylactic importance for clinical practice. The research also confirms the fact revealed in the latest data from the international literature regarding the consumption of psychoactive substances from young ages, with multiple comorbidities and recurrent behavioral disorders secondary to drug use and major difficulties in following the recommendations of treatment and to get the remission that put their mark on the failure of education and personal development.

**KEY WORDS:** attention deficit hyperactivity disorder, adult ADHD, substance abuse, comorbidity.

**RIASSUNTO. Introduzione.** Il disturbo da deficit di attenzione/ipertattività (ADHD) ha un alto grado di ereditarietà ed è un quadro clinico diventato recentemente una sfida non solo per i neuropsichiatri dell'infanzia e dell'adolescenza ma anche per gli psichiatri dell'età adulta. Gli ultimi studi e i manuali diagnostici mostrano che i sintomi dell'ADHD non sono "sovrastimati" nell'adulto ma che la loro espressione semplicemente cambia. **Metodo.** Il presente studio ha investigato la presenza dei sintomi dell'ADHD in un gruppo di 104 pazienti adulti facenti abuso cronico di sostanze, ammessi nei servizi psichiatrici. I soggetti selezionati sono stati valutati mediante la somministrazione della scala DIVA, specifica per la valutazione dell'ADHD nell'adulto. **Risultati.** Lo studio ha dimostrato che il 46% di coloro che abusavano di sostanze, inclusi nello studio, avevano specifici sintomi che hanno consentito la diagnosi di ADHD nell'adulto. Dei 54 soggetti che avevano risposto ai criteri di ADHD nell'infanzia, solo 6 non rispondevano agli stessi criteri nell'adulto, quindi l'89% dei pazienti con ADHD manteneva questi sintomi anche in età adulta, con disfunzioni in alcune aree della vita. **Conclusioni.** La diagnosi di ADHD nel gruppo selezionato è correlata a un aumento della vulnerabilità, fino a due volte, del consumo cronico di psicostimolanti. È questa un'osservazione di grande importanza terapeutica e preventiva per la pratica clinica. La ricerca ha anche confermato quanto rilevato nella letteratura internazionale più recente riguardo al consumo di sostanze psicoattive in età giovanile, con la presenza di numerose comorbidità e ricorrenti disturbi comportamentali secondari all'uso di sostanze e la maggiori difficoltà nel seguire le raccomandazioni di trattamento per ottenere una remissione rispetto a una pratica errata che ha lasciato il segno nello sviluppo personale e educativo.

**PAROLE CHIAVE:** disturbo da deficit di attenzione e ipertattività, ADHD nell'adulto, abuso di sostanze, comorbidità.

## INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder commonly diagnosed among pediatric patients; nonetheless, its etiology, and differential diagnosis in adulthood continue to be surrounded by controversies in the literature.

Even though the prevalence of the disorder tends to decrease with age, longitudinal studies show that more than half of children with ADHD are experiencing major difficulties even in adulthood<sup>1</sup>. Over time, it has been considered that as the patient gets older, the disorder is "outgrown" in its natural evolution. Subsequent scientific research has shown that this might not be the correct developmental trajectory.

In some patients a reduction in the severity of symptoms (generally hyperactivity) can be witnessed; however, in 60% of them, their symptoms remain stressful, and 90% continue feeling dysfunctional in adulthood<sup>2</sup>.

In a very large number of cases, the symptoms do not remit in adolescence, but persist into adulthood, being associated with a large number of psychiatric and even somatic comorbidities, thus favouring the underdiagnosis and delay of appropriate intervention<sup>3</sup>.

In 2018, Uchida et al published the results of a longitudinal study which concluded that 77% of children and adolescents with an ADHD diagnosis will continue to manifest symptoms with variable intensity in adulthood. 35% kept meeting the ADHD criteria in adulthood and 45% manifested subclinical symptomatology which interfered with their functioning<sup>4</sup>.

The prevalence of ADHD in adults is estimated in epidemiological studies to range between 2% and 5%<sup>5</sup>, but less than one third of these have been diagnosed in the United States and far fewer in European countries<sup>6</sup>.

In adults, 75% of those diagnosed have at least one associated disorder, but the average is three associated psychiatric comorbidities like affective disorders, anxiety, sleep, personality and other neurodevelopmental disorders<sup>7,8</sup>. ADHD has also been associated with early onset of substance abuse and gambling, with adults often having many addictions<sup>9</sup>.

ADHD is considered a risk factor for substance abuse<sup>10,11</sup> and Wilens et al.<sup>12</sup> hypothesized in 2004 that there is an overlap between these two mental disorders. In 1995, Biderman et al.<sup>13</sup> published the results of their study, stating that the lifetime prevalence of substance abuse is 52% in ADHD population and 27% in general population without ADHD. 15-25% of adults with substance abuse and 34-46% of cannabis users<sup>14</sup> had a diagnosis of ADHD, according to Wilens<sup>12</sup>. The risk for substance abuse is higher among adults with persistent ADHD, but it is also present in those with subclinical symptoms. The combined and hyperactivity-impulsivity subtypes are more frequently associated with substance abuse<sup>7</sup>. Adults with ADHD start using drugs at an earlier age than those without ADHD and keep using for longer<sup>15</sup>.

There are multiple hypotheses regarding the causal link between ADHD and substance abuse, one of them being the tendency to use recreational drugs as a method of self-medication<sup>12</sup> or to lower the intensity of negative emotions among those with ADHD<sup>16</sup>. Other hypotheses state the lack of self-control caused by an executive functioning deficit (the risk for substance abuse is elevated by impulsivity and by the tendency of developing antisocial behaviours)<sup>17</sup>, a deficit in the reward system or a genetic overlap between these conditions<sup>7,16</sup>.

ADHD and substance abuse share a genetic underlayer and an important degree of heredity - between 40 and 70%<sup>17</sup>. The study of Gurriarán, published in 2019, investigates the relationship between substance abuse and other mental disorders, including ADHD, based on polygenic risk<sup>18</sup>.

There is a multitude of studies regarding the vulnerability of ADHD patients for binge drinking and drug use, latest data incriminating ADHD as a risk factor for addictive behaviour through its overlapping neurobiological mechanisms. In ADHD and substance use disorders, the mesolimbic and

mesocortical dopaminergic circuits are dysfunctional, the result being the deficiency of the reward system and impulsivity. Secondary to the reward system deficit, the brain no longer reacts to natural rewards and will therefore be motivated to engage in impulsive reward-seeking behaviours. Addictive drugs can activate the reward system through dopaminergic networks and, at the same time, the motivation needed to engage in the behaviour of procuring recreational substances<sup>17</sup>.

Studies on animal models with ADHD show that mutations of dopamine transporter gene can determine a complete selective blockage of the striatal cannabinoid receptors when administering addictive substances or after a reward-system activating event<sup>19</sup>. The striatal activation related to the reward process is correlated in animal models with the level of glutamate in the hippocampus, which in Bossong et al.<sup>20</sup> opinion may be relevant for the mental disorders in which the reward process is affected.

These studies and findings underline the importance of identifying and treating ADHD in childhood as well as in adulthood, especially in those patients referring to a psychiatry service for substance abuse. Lately, there have been efforts to identify and develop numerous neuropsychological tests/instruments that allow better investigation of the neurocognitive deficits that characterize this disorder<sup>21</sup>. In order to decrease the dysfunctionality in adulthood and the chronic evolution of comorbidities, we consider it necessary to evaluate and diagnose this pathology as early and as accurately as possible.

## METHODS

The present research aims to evaluate the presence of ADHD-specific symptoms in a group of adult patients diagnosed with psychoactive substance abuse, admitted in a psychiatry service with addiction profile, from "Prof. Dr. Alexandru Obregia" Psychiatry Hospital, Bucharest, Romania. The present study is a cross-sectional, non-experimental, observational study conducted on a group of 104 subjects.

**Inclusion criteria:** the presence of the diagnosis of psychoactive substances abuse at the time of the study; young adult (age between 18 and 28 years); expression of the agreement to participate in the study and to complete the instruments needed to carry out the research.

**Exclusion criteria:** the presence of Autism spectrum disorders or Intellectual disability; the presence of withdrawal symptoms specific to the consumption of psychoactive substances; the presence of a psychotic or affective disorder (eg. mania) that could have interfered with the results and the ability to answer the questionnaires; the presence of a physical illness that could have interfered with the ability to participate in the research (sight, hearing, etc.)

The diagnostic instrument used to evaluate ADHD symptomatology in the selected group was DIVA 2.0, the first structured interview for adults with ADHD, developed in 2010 by J.J.S. Kooij<sup>22</sup>. We chose this interview because it is translated into Romanian language and offers free online access for clinical and research purposes. Moreover, in a Swedish study, DIVA 2.0 was found to have a good ability to discriminate between patients with and without ADHD (sensitivity 90.0%, specificity 72.9%)<sup>23</sup> and it

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proved to be a reliable tool for assessing and diagnosing Adult ADHD in a Spanish study<sup>24</sup>.

In order to simplify the evaluation of the subjects, DIVA 2.0 exemplifies each symptomatic manifestation, adapted for the adult age. There are also specified present situations that can affect five areas of daily life of the individual allegedly affected by ADHD. For the diagnostic formulation it is necessary to retrospectively detect the installation of symptoms at the age of childhood<sup>21</sup>.

DIVA 2.0 is an instrument that is based on the patient's responses, both regarding the current symptomatology (present in the last 6 months) and the presence of specific ADHD manifestations in childhood (between the ages of 5 and 12 years). Additionally, one of the sections of the interview concerns the age of onset and investigates whether the manifestations started before the age of 7<sup>22</sup>. In some cases, it was either possible or necessary to request a family member to confirm the information offered by patients or to provide additional knowledge related to symptoms manifested during childhood years.

Subsequent to the selection and inclusion in the study, the group was divided into two subgroups according to the presence or absence of ADHD, as follows:

*Control group:* patients diagnosed with psychoactive substance abuse that do not meet the diagnostic criteria for adult ADHD.

*Experimental group:* patients diagnosed with psychoactive substance abuse meeting the diagnostic criteria for adult ADHD.

*Statistical analysis:* the variables were entered into a database using Microsoft Office Excel 2007. Statistical data processing was performed using IBM SPSS Statistics 20 and descriptive and inferential statistical tests were used. For the graphical representation of the results, circular diagrams were used for the nominal qualitative variables and bar graphs or histograms for the discrete quantitative variables. A descriptive analysis of the quantitative variables was performed and, based on the measurements of the central tendency and the dispersion, the type of data distribution was established - parametric and non-parametric distribution, respectively. The type of distribution was taken into account when choosing the correlation coefficient calculated to describe the relationship between 2 quantitative variables, so the Spearman coefficient was chosen. For the hypothesis testing, the z test for comparison of proportions was used, with a  $p < .05$  significance level.

This part was actually consisting of 48 adults who met all the necessary ADHD criteria out of a total of 68 subjects who declared having the required adult-age symptoms for diagnosis. Therefore, of the initial chosen group of 104 subjects consuming psychoactive substances, 48, representing 46%, met the criteria for the diagnosis of ADHD (Figure 1).

Of the subjects who stated that they currently meet the criteria for an ADHD disorder, in 29% this diagnosis was excluded because the symptomatology was not present during childhood. (Figure 2). Thus, the declared manifestations, which may overlap ADHD criteria, may be part of the clinical picture of another psychiatric disorder<sup>25</sup>.

Of the 54 subjects who met the ADHD criteria in childhood, only 6 of them did not meet these criteria in adult life (Table 1, Figure 3). Therefore, 88.9% of the people who met the diagnostic criteria for ADHD retained this diagnosis in adulthood, this percentage supporting the latest research, which emphasizes that ADHD symptoms persist after childhood, having clinical and psychosocial implications<sup>25</sup>.

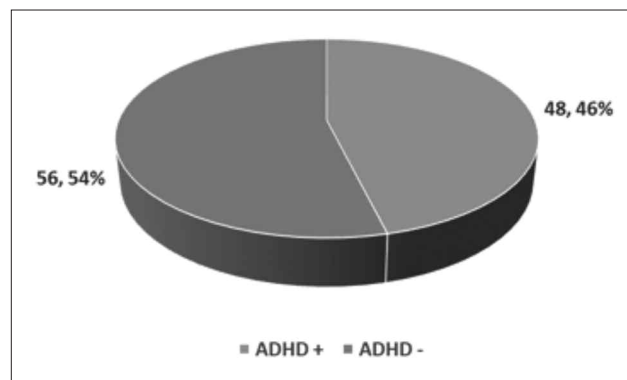


Figure 1. Percentage distribution regarding ADHD diagnosis in the selected group.

**RESULTS**

The study included 63 male subjects (60.58%) and 41 female subjects (39.42%).

After completing the questionnaire, at the declarative level, it was found that 65.38% of the respondents fulfilled the diagnostic criteria for ADHD in adulthood. The DIVA 2.0 instrument, developed based on DSM IV diagnostic criteria, considers sufficient 4 or more symptoms in the category of hyperactivity/impulsivity or inattention in order to meet the diagnosis of ADHD<sup>21</sup>. In addition to the presence of this minimum number of symptoms, for the diagnosis to be considered, it is necessary that the symptoms were present during childhood, with an onset before the age of 7 and. Therefore, of the 68 respondents who declared that they currently meet the minimum number of criteria for an ADHD disorder in adulthood, only a part described having the symptoms as children as well.

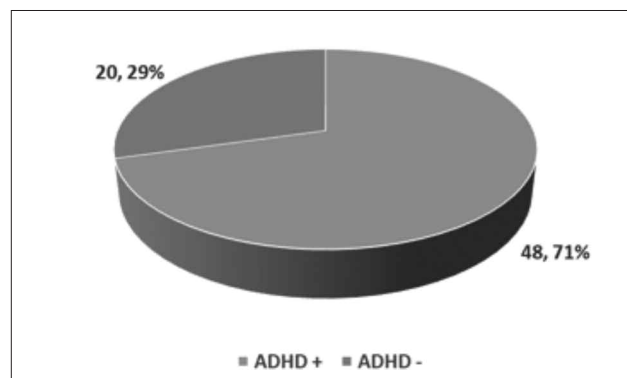


Figure 2. Percentage distribution of ADHD diagnosis among those who have declared ADHD criteria in adulthood.

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Table 1. Contingency table for the correspondence between ADHD criteria in children and adults.

	ADHDc+	ADHDc-	Total
ADHDa+	48	20	68
ADHDa-	6	30	36
Total	54	50	104

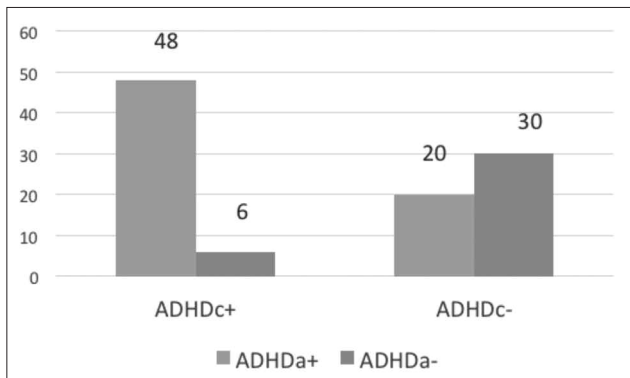


Figura 3. Correspondence between ADHD criteria in childhood and adulthood.

In childhood, the combined type was the most frequent form (70.83%), followed by the predominantly inattentive type (IA) – 18.75% and the predominant form with hyperactivity/impulsivity (HA/I) – 10.42% (Figure 4). The combined type of ADHD is characterized by hyperkinetic, impulsive symptomatology and attention deficit.

Regarding the percentage distribution of ADHD types in adulthood (Figure 5), the highest percentage belonged to combined type – 68.75%, respectively 33 subjects. The types of ADHD appeared in similar frequencies in the childhood

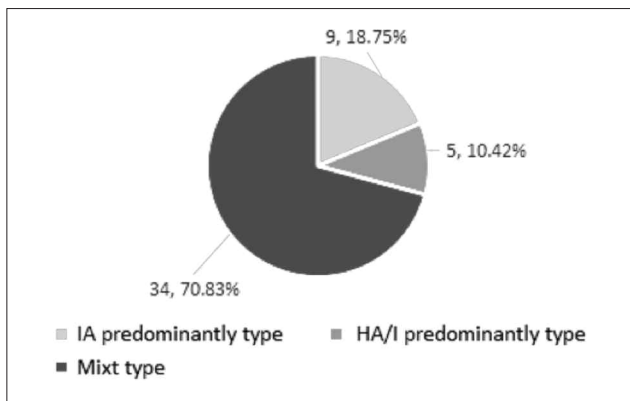


Figura 4. Percentage distribution of ADHD types in childhood.

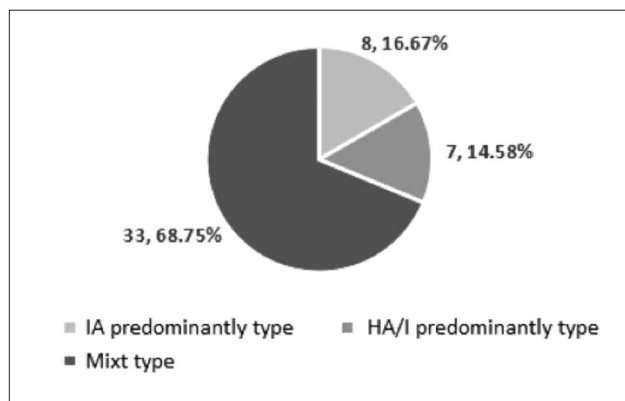


Figure 5. Percentage distribution of ADHD types in adulthood.

model, the mixed type being followed by the predominantly inattentive type (8 subjects, 16.67%) and then by the predominant type with hyperactivity/impulsivity (7 subjects, 14.58%).

Figure 6 summarizes the evolution of ADHD form with aging. Most subjects retained the diagnostic form found in childhood, meaning that, even if the symptomatology transformed, the manifestations were from the same range – inattention, hyperactivity / impulsivity or combined.

Table 2 presents the measurements of the central tendency (mean and median) for the scores obtained by subjects in childhood and as an adult for each of the domains as well as the standard deviation as a measure of dispersion.

A t-test showed that there was a statistically significant difference between the values of inattention scored in childhood and those in adulthood ( $t=32.43$ ,  $df=33$ ,  $p=.00$ ). Also, there was a statistically significant difference between the values for hyperactivity / impulsivity scored in childhood compared to adulthood ( $t=37.66$ ,  $df=33$ ,  $p=.00$ ).

Regarding the drug use in the selected group of subjects, the most used substances were cannabis and heroin (each with 44 subjects, representing 28.39%), followed by alcohol 27.74%.

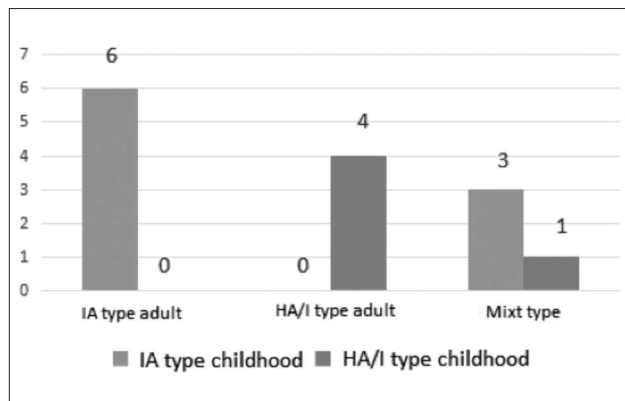


Figure 6. Evolution of ADHD types from childhood to adulthood.



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Table 2. The central tendency measurements for the scores obtained on domains of childhood and adulthood

	Childhood		Adulthood	
	Mean+/-SD	Median	Mean+/-SD	Median
Type HA/I	6.75+/-1.70	6.5	7+/-1.41	7.5
Type IA	7.33+/-1.63	7.5	7.5+/-0.84	7
Combined type IA	7.53+/-1.35	7	7.5+/-1.78	8
HA/I	7.94+/-1.23	8	7.56+/-1.56	8

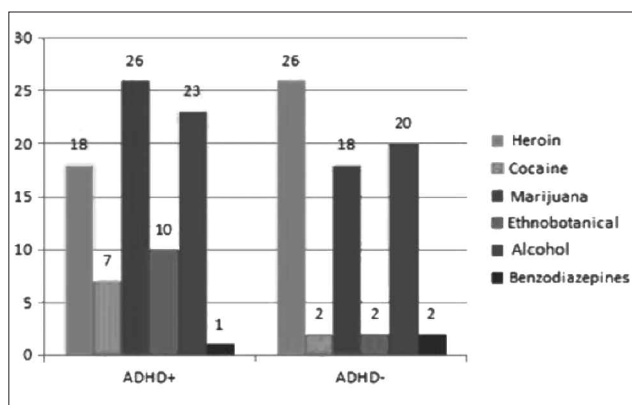


Figure 7. Type of drugs depending on the presence or absence of ADHD.

Alcohol consumption has been identified in a large number of cases, our country occupying one of the first places in Europe for heavy episodic drinking<sup>27</sup>, defined as a consumption of at least 60 g of pure alcohol in one occasion, at least once a month<sup>27</sup>.

Fisher test was performed to see if there was an influence of ADHD status (presence/absence) on the type of substance used. There was a significantly higher number of cannabis users who met the ADHD criteria compared to those without ADHD. There was a significantly higher number of new psychoactive substances users diagnosed with ADHD compared to those of new psychoactive substances users without ADHD. In terms of heroin use, there were a significantly higher number of subjects without ADHD who used this drug, compared to those with ADHD who consumed the same substance. For alcohol, cocaine and benzodiazepines, no statistically significant differences were identified between the groups with and without ADHD.

DISCUSSION

In the group of adult patients with substance abuse, 46% met the criteria for the diagnosis of ADHD. These results are

consistent with the data from the literature on the prevalence of ADHD among psychoactive substance users<sup>28,29</sup>.

The specific symptoms for ADHD that allow, according to the DIVA 2.0 test, the formulation of the diagnosis of ADHD in adulthood was maintained in 88.9% of the participants who met the criteria of ADHD in childhood. Our findings are consistent with latest research, which emphasizes that ADHD symptoms persist after childhood, having clinical and psychosocial implications<sup>26</sup>. Karam, in 2015, publishes the results of a 7-year longitudinal study involving 344 patients. It is reported that despite cognitive and neuronal maturation, 66% of subjects retain the diagnosis of ADHD 7 years later<sup>30</sup>. Whether the disorder continues to manifest resoundingly or symptoms decrease in intensity, for approximately two-thirds of children diagnosed with ADHD, these specific symptoms affect their daily activity later in adulthood<sup>31</sup>.

The different clinical picture of ADHD depending on the age of presentation leads to underdiagnosis of this disorder in adulthood. The specific symptoms of this disorder in childhood are much more evident than the manifestation in adult age, when hyperactivity decreases in intensity and can be manifested by inner restlessness, but impulsivity, organizational difficulties, and distractibility are obvious<sup>32</sup>.

Up to 77% of ADHD children will keep manifesting clinical or subclinical symptoms into adulthood, this symptomatology affecting their functioning and quality of life<sup>4</sup>.

In our sample, in childhood, the combined type was the most frequent form (70.83%), in agreement with the data from the specialty literature regarding the frequency of ADHD types, this type being the most commonly reported, accounting for up to 80% of all diagnosed ADHD cases<sup>33</sup>, followed by the predominantly inattentive type (IA) and the predominant form with hyperactivity/impulsivity. The same order of frequencies of ADHD types in adulthood was maintained with the childhood model, the combined type (68.75%) being followed by the predominantly inattentive type (16.67%) and then by the predominant type with hyperactivity/impulsivity (14.58%). Other studies state that ADHD subtypes of hyperactivity-impulsivity or combined are more often correlated with substance abuse<sup>7</sup>.

In our sample there was a statistically significant difference between the values for hyperactivity/impulsivity scored in childhood compared to adulthood ( $t=37.66$ ,  $df=33$ ,  $p=.00$ ). The differences of scores between childhood and adulthood, respectively the increase of the scores for hyperactivity and the decrease of the scores for inattention with aging can be explained both by the modification of the symptomatology and by the difference of perception on these manifestations. Thus, at a young age, a certain degree of hyperactivity is characteristic of typical children, while in adulthood motor restlessness is easily observed and evident. Also, as he gets older, the ADHD patient becomes more aware of the hyperkinetic manifestations and will report them in the DIVA questionnaire. Regarding the scores for inattention that decrease in adulthood, a possible explanation can also be found in increasing awareness, so that the individual can develop coping mechanisms and control of concentration disorders. At the same time, at an early age, the manifestations of inattention can be easier to identify, especially in the school environment where the child is closely supervised by the teachers, while in the adult these are more subtle and less obvious to the people around.

Regarding the drug use in the selected group of subjects, the most used substances were cannabis and heroin (28.39% for each of them), followed by alcohol 27.74%. In the European report for Romania, made in collaboration with ANA (National Anti-drug Agency) on drug use in 2019, it is stated that among the drug users, cannabis is the most commonly used, representing 49%, followed by heroin with 24%<sup>34-39</sup>.

It should be noted that the report does not include alcohol consumption<sup>40</sup>. The placement on the first 2 places of these psychoactive substances in our country can be explained by the fact that they are among the cheapest drugs.

In the selected group, cannabis and heroin were represented in the same proportion, the cannabis consumption being below the average level of the country and that of heroin above the level stated in the national report. These differences can be explained by the fact that the subjects were chosen from the persons admitted to a psychiatry department with an addiction profile. Cannabis use, although more frequent than heroin, does not determine similar levels of addiction and somatic symptoms and therefore cannabis users are less likely to be admitted to an inpatient unit. In the case of heroin, the physical symptoms of withdrawal occur within 8-10 hours of the last dose and reach a symptomatology peak after 36-72 hours, that includes myalgia, irritability, nausea, vomiting, pupil dilation and sleep disorders. This severity of the clinical picture during the withdrawal period is what brings the patient to the hospital<sup>42</sup>.

## CONCLUSIONS

Most studies reported by the literature on the topic of association of substance use with adult ADHD pathology were performed in groups of patients diagnosed with ADHD in which behavioral problems secondary to the use of psychostimulants were investigated. This research also brings novelty through the retrospective investigation of ADHD symptoms in adulthood in a group of patients admitted to a psychiatric addiction service.

The findings of this research emphasize the common difficulties associated with ADHD, most of the patients enrolled in the study having more than one admission to psychiatric services and reporting more than two addictive substances consumed simultaneously in the past 6 months.

Early diagnosis of ADHD and its comorbidities could better guide the therapeutic and preventive intervention for these patients in order to improve the quality of life and the prospect of their cognitive and personality development. The originality of the research lies primarily in the chosen topic, because the diagnosis of ADHD in adults is a new concept. The conclusions of the paper bring new, innovative details to raise awareness among drug-abuse psychiatry services regarding the presence of an ADHD diagnosis in adults, which could also imply that these patients have the chance to better, adapted and individualized intervention programs during their critical young-adult years.

*Conflict of interests:* the authors have no conflict of interests to declare.

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