

## Research Article

## Journal of Addiction Research

## Epidemiological, Substance Use Profile and Psychological Outcomes in Methanol Intoxicated Patients

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Submitted: 2023, June 15; Accepted: 2023, July 02; Published: 2023, July 10

**Citation:** Jaballah, F., Ferhi, M., Hannachi, H., Mannai, J., Merzougui, L. (2023). Epidemiological, Substance Use Profile and Psychological Outcomes in Methanol Intoxicated Patients. *J Addict Res*, 7(2), 39-48.

## Abstract

**Background:** The use of psychoactive substances (PAS) is nowadays a priority in the field of psychiatric research. It is a public health problem linked to dependence and mental health disorders in terms of causality and co-morbidity.

**Objective:** To establish the epidemiological profile, assess the dependence on alcohol and other psychoactive substances in subjects consulting for acute intoxication with methanol, and study the prevalence of anxiety and depression in these patients.

**Methods:** In order to better understand the phenomenon of PAS consumption among young adults, we conducted a descriptive cross-sectional study among patients who presented an acute collective intoxication with methanol-based cologne in May 2020 in Hajeb El Ayoun in Kairouan, Tunisia.

**Results:** Patients had a particular epidemiological status in terms of numerous criteria. PAS addiction prevalence was among the majority of participants including alcohol, cannabis, and drugs (respectively 86%, 69.8%, 46.5%). Also, depression and anxiety evaluation rates were high (more than 79% for definite symptomatology). Furthermore, we found a statistically significant association between anxiety and alcohol dependence ( $p=0.032$ ), and depression and addiction to a medication or a drug ( $p=0.017$ ).

**Conclusions:** It is essential to set up strategies to prevent the consumption of PAS to avoid its harmful consequences. Moreover, determining factors associated with this addiction could allow us to pay attention to the vulnerable subjects to make the screening much easier and more accessible to prevent the occurrence of mental disorders such as anxiety and depression.

**Keywords:** Methanol Intoxication, Psychological Outcomes, Anxiety, Depression, Addiction

## 1. Introduction

The use of psychoactive substances (APS) is nowadays a priority in the field of psychiatric research [1]. It affects all social classes, regardless of their socio-economic or cultural level. It is a public health problem with consequences linked to the concept of addiction [2,3].

Currently, the emergence of new habits such as the consumption of perfume (eau de parfum) based on methanol is a problem for public health in Tunisia. Often confused, methanol and ethanol are two types of alcohol, with different chemical formulas and especially dissimilar toxic properties. Ethanol is used as an ingredient in most alcoholic beverages while methanol consumption can be fatal, due to its significantly higher toxicity [4,5].

Methanol is a non-potable alcohol, mainly used as a chemical component in the eponymous industry. It is widely used as a solvent, especially in paints, lacquers and is the carrier frequently used in the manufacture of perfume, which is composed of three distinct elements: the odorant concentrate, the carrier and the fixative, also used as a fuel in aeronautics, or the production of biodiesel [5].

In case of methanol intoxication, the clinical presentation evolves in two phases during which neurological disorders (headache, drowsiness, drunkenness...) also present in case of ethanol intoxication. In cases of hyperosmolarity, patients may experience gastrointestinal symptoms such as nausea, vomiting, and abdominal pain, as well as polyuria and a sensation of thirst. The clinical presentation of the second phase of this condition is characterized by decompensated metabolic acidosis, which may

be accompanied by hyperventilation and Kussmaul breathing. Neurological symptoms, including coma, convulsions, cerebral edema, and ocular lesions such as papilledema and optic neuritis, reduced visual acuity, and even permanent blindness [5-7]. Death may occur due to cardiorespiratory failure. In case of survival, the ocular sequelae are often significant.

Indeed, methanol consumption is a problem in developing countries. The lethal dose is 1 mL/kg. The toxic dose of methanol depends on the individual and the pharmacologically active products he or she receives. A concentration of methanol in the blood greater than 500 mg/L is associated with severe toxicity, while a concentration greater than 1500-2000 mg/L results in death. In contrast to ethanol poisoning, the clinical manifestations of acute methanol poisoning typically present later, exhibit greater severity, and have a more prolonged duration. Methanol is well absorbed by the respiratory, oral and percutaneous routes and is rapidly distributed in the body. If absorbed through the digestive tract, peak plasma levels are reached after 30 to 60 minutes. Its plasma half-life is approximately 24 hours [4].

Methanol acts on  $\gamma$ -aminobutyric acid type A (GABA) receptors as a neuromediator increasing the transmembrane ionic flow inducing a state of inhibition at the level of synaptic transmission (slowing effect). It produces effects similar to those of benzodiazepines and barbiturates, which act on the same receptor but at different sites. This similarity includes the addictive potential, which is also similar [7]. This addictive potential causes a strong dependence, which progressively sets in according to 3 stages: the search for pleasure, a negative emotional state and the loss of control [8].

In this context, an acute collective and involuntary intoxication by perfume water occurred in May 2020 affecting 76 patients from the same region in Kairouan (Hajb El Ayoun) causing the death of 7 people. This situation has opened debates mainly around the dangerousness of this substance and its impact on the psychological state, justifying our study, which aims to establish the epidemiological profile, assess the dependence on alcohol and other psychoactive substances in subjects consulting for acute intoxication with methanol, and study the prevalence of anxiety and depression in these patients.

## 2. Material and Methods

### 2.1. Study Design

This is a descriptive cross-sectional study that was conducted among patients who presented acute collective intoxication with methanol-based eau de parfum during the month of May 2020.

### 2.2. Setting

After two weeks of their hospitalization period, while respecting their consent for this study, a team of 6 trained physicians and psychologists participated in the data collection. We solicited the participation of the candidates while insisting on the respect of confidentiality and anonymity. The data collection was carried out in the regional hospital of Hajeb El Ayoun, through individual interviews with the patients. In order to optimize the participation rate and alliance, the interviews were individual

around 60 minutes each. This research received the approval of the ethics committee of Ibn El Jazzar Hospital affiliated to the university of Sousse in the country of Tunisia before the data collection.

### 2.3. Participants

We tried to recruit the 69 patients suffering from acute methanol intoxication who consulted or not, the emergency department of the Ibn El Jazzar hospital in Kairouan. Among these patients, only 43 met the inclusion criteria.

**2.3.1. Inclusion Criteria:** Patients with acute methanol intoxication; patients who gave their consent; aged over 16 years.

**2.3.2. Non-Inclusion Criteria:** Patients who were not present at the prearranged appointment; patients who were not mentally retarded; patients with sensory hearing impairment; patients who could not be reached by phone or by the mayor of the site; patients who died as a result of intoxication; patients who refused to participate in the study.

### 2.4. Assessment Methods

#### 2.4.1. Sociodemographic and Clinical Data

We used a pre-established questionnaire regarding the patients' Sociodemographic characteristics, personal and family history, clinical status and lifestyle habits.

#### 2.4.2. Alcohol Use Disorders Test (AUDIT)

In its standard version developed by Saunders et al. In 1993, is a simple 10-question test rated from 0 to 4 developed by the WHO to determine if a person is at risk for alcohol addiction. The first 3 questions deal with patient consumption, questions 4-6 deal with dependence and questions 7, 8, 9, and 10 deal with alcohol-related problems. A score of 8 or less for men and 7 or less for women indicates low or benign risk. A score between 7 and 12 for men and between 6 and 12 for women indicates risky drinking. A score above 12 indicates probable alcohol dependence.

#### 2.4.3. The Cannabis Abuse Screening Test (CAST)

Is a tool for identifying cannabis misuse which has been developed since 2002 by the general population survey unit of the French Monitoring Center for Drugs and Drug Addiction? It is based on the main criteria for determining abuse and harmful use from the DSM-IV diagnoses, and aims to provide a description and an estimation of problematic use in epidemiological surveys in the general population. The CAST is interpreted according to the sum of the scores of the 6 questions. Each answer is scored from 0 to 1. A score lower than 3 means no risk of dependence, between 3 and 6: low risk of dependence, and higher than or equal to 7: high risk of dependence on cannabis.

The Drugs Abuse Screening Test (DAST 10) Was developed by the Addiction Research Foundation in Toronto, Canada. It assesses the degree of severity of drug use [9]. Questions ask about drug use (excluding alcohol and tobacco) in the past 12 months. The DAST is interpreted based on the sum of 10 questions. Each question is scored from 0 or 1. A score between

0 and 1: low risk or non-problematic use, 2 to 4: possible risk (outpatient follow-up), a score higher than 4: substantial risk with a severe risk of addiction (intensive follow-up).

#### 2.4.4. Hospital Anxiety and Depression Scale (HAD)

The HAD questionnaire was developed by Zigmond and Snaith in 1983 to screen for anxiety disorders and depressive syndromes in non-psychiatric inpatients [10]. It is a self-report scale that allows rapid screening of patients at risk without making a diagnosis of anxiety disorder or depression. It has two subscales assessing the level of general anxiety (7 items) and the level of depression (7 items), each rated from 0 to 3. The total points of the anxiety and depression side: 21 points maximum for each, interpreted as follows: a score lower than 7: absence of anxious or depressive semiology. Between 8 and 10: doubtful state of anxiety or depression. Above 11: definite state of anxiety or depression.

#### 2.4.5. Statistical Methods

For the analysis of the collected data, SPSS.20 software was used. We used absolute and relative frequencies to express the qualitative variables. We studied the association, and to compare qualitative variables, we used the "Chi2 test". Significance level was set at 5%.

### 3. Results

We distributed 43 questionnaire forms to the candidates included in the study and present at the pre-arranged appointment. 43 forms were received, for an overall participation rate of 100%.

#### 3.1. Epidemiological Profile

Table 1 contains the sociodemographic and clinical outcomes of the patients.

		n	Percentage
Age (mean 28+3,2) years	17-22	10	23.25
	22-27	12	27.9
	27-32	7	16.27
	32-37	3	6.97
	37-42	5	11.62
	>42	6	13.95
Gender	Male	43	100
	Female	0	0
Marital status	Single	23	54
	Married	18	42
	Divorced	2	4
Habitat	Urban	13	30.2
	Rural	30	69.8
Employment	No	9	17.1
	Yes	34	82.9
School level	Illiterate-Primary	31	72
	Secondary	11	25
	University	1	3
Parents school level	Illiterate-Primary	31	81.58
	Secondary or higher	12	18.42
Diploma	yes	2	6
	No	41	94
Been assaulted or sexually harassed during childhood	Yes	10	23.33
	No	33	76.67
Childhood well-being score	0	11	25.58
	1	20	46.51
	2	3	6.97
	3	1	2.32
	4	2	4.65
	5	5	11.62
	7	1	2.32

History of incarceration	Yes	For PAS use	17	73.91
		For other reasons	6	26.09
		Total	23	54.76
	No		20	45.24
History of non psychiatric diseases	Yes		11	13.81
	No		32	76.19
History of psychiatric diseases	Yes		4	8.69
	No		39	91.31
Cause of initial hospitalization	Neurological symptoms		12	30.8
	Digestive symptoms		9	23.2
	Ophthalmologic symptoms		2	5.1
	Respiratory symptoms		3	7.6
	No symptoms		13	33.3
Department of hospitalization	Emergency		35	89.7
	Pneumology		2	5.1
	Intensive Care		1	2.6
	Ophthalmology		1	2.6
Evolution during hospitalization	Rapid improvement		32	76.19
	Stabilization under monitoring		4	9.52
	Aggravation		7	14.29
Withdrawal motivation	yes		34	79.06
	no		9	20.94
Possibility of withdrawal	yes		36	85.7
	no		7	14.29
Need for help with withdrawal	yes		30	69
	no		13	31

**Table 1: Sociodemographic and Clinical Data (n=43)**

All participants were male. The mean age of the candidates was 28±3.2. 54% (n=31) of the participants were single, 42% were married and 4% were divorced.

In addition, 30 participants were living in a rural area (69.8%), and 13 participants were settled in the town of Hajb El Ayoun.

With regard to education and sociol-professional level, 72% of the participants had a primary school education or less, while 11 candidates had a secondary school education and only one candidate had started a university education.

Also, 82.9% of the candidates (n= 34) were unemployed, but 9 had a profession. 94% (n=41) did not have a diploma of completion of studies against only 2 who had it.

Our study showed that almost half of the patients, 48.3% (n=21) set a budget almost equal to half of what they earn per month for their PAS consumption. 86.04% of the participants (n= 37) would be guided in their choice of PAS consumed by their economic levels and their monthly earnings.

Furthermore, 75% of the candidates (n=32) confirmed an act of aggression to satisfy the imperative need to consume PAS and

54.76% of the candidates (n=23) had been incarcerated at least once. Among them, 73.91% (n=17) were incarcerated in relation to the use of APS, while 6 were incarcerated for other reasons.

Regarding parental harassment or aggression during childhood, 23.33% of patients confirmed the occurrence of these acts, while 76.6% denied it.

Candidates' responses rating wellbeing during childhood, on a scale of 1 to 10, had an average score of 1 out of 10, and 82% of candidates gave an estimate of less than 3/10.

The average age of onset of use was 16 years. The most consumed substance was eau de parfum (92.9%).

According to our results, 90% of the participants (n=39) had already used PAS regularly before the age of 25. The first contact for our participants before testing them was for the most part in the neighborhood (73.33%, n= 35).

Besides, 60.98% of the candidates (n=26) did not receive any advice or family guidance on the harms of drugs during their childhood, on the other hand, 17 had this advice message from their families. On the other hand, 79.5% (n=34) of the candidates

confirmed that they had never seen awareness campaigns or documentaries about the PAS, while 20.5% had.

### 3.2. Clinical Data

Table 1 shows clinical data of the patients. 35 patients were hospitalized following their acute intoxication in an emergency department, nevertheless, 2 were hospitalized in a pneumology department, 1 in an intensive care unit and 1 in an ophthalmology department. 76.19% (n= 32) of the participants were hospitalized for monitoring after a rapid improvement, 9.5% were stabilized, but required close monitoring, while 14.2% of the patients presented a fairly serious clinical state on admission requiring recourse to intensive care with strict monitoring in an adapted service.

### 3.3. Assessment Results

Our study showed that 46.5% of the patients (n=20) had an addiction to a drug or medication, 5 had a problematic use of drugs or medication, nevertheless, 18 candidates did not have a problem of drug or medication use. It was also found that 69.8% of the participants (n=30) had a low risk of cannabis dependence, 1 had a moderate risk, however 12 had a high risk of dependence. In addition, 37 patients (86%) had a probable rate of alcohol dependence, and 6 candidates had risky or problematic consumption.

Of the 43 patients, 83.7% (n=36) had definite anxiety symptomatology, 3 had questionable symptomatology, and 4 candidates had no anxiety symptomatology. We found a statistically significant association ( $p=0.032$ ) between candidates with definite anxiety symptomatology and alcohol dependence.

Furthermore, we found that 79% (n=34) had definite depressive symptomatology, 3 candidates had questionable symptomatology and 6 had no depressive symptomatology. There was also a statistically significant association ( $p=0.017$ ) between candidates with definite depressive symptomatology and addiction to a medication or drug.

## 4. Discussion

### 4.1. Summary of Main Findings

The aims of our study were to establish the epidemiological profile of methanol users, to evaluate the dependence on other psychoactive substances and to determine the prevalence of anxiety and depression in these patients.

At the end of our work, we found that the 43 participants were exclusively male and that the majority lived in a rural environment, has experienced a disrupted childhood, is unemployed, has no diploma, and has a low socio-economic level.

		n	%
Cannabis addiction (CAST)	High risk	27.91	
	Moderate risk	2.33	
	Low risk	69.77	
Drug and medication dependence (DAST-10)	Addiction	46.51	
	Problematic use	11.63	
	Problem-free use	41.86	
Alcohol addiction (AUDIT)	Probable dependence	86	
	Risky consumption	14	
HAD	Anxiety	Certain symptomatology	
		Questionable symptomatology	84
		No symptomatology	3
		Certain symptomatology	4
	Depression	Questionable symptomatology	34
		No symptomatology	3
		No symptomatology	6

**Table 2: Results of CAST, DAST-10, AUDIT and HAD (n=43)**

The beginning of exposure and consumption of PAS coincides with adolescence, and the rate of consumption of PAS increases in parallel with the rate of school failure, unemployment, and the low socio-cultural level of parents with an average age of onset of PAS consumption at 16 years, the most common of which is eau de parfum (based on methanol) that was marketed at low prices.

Besides, most of the patients suffered from an addiction to alcohol and cannabis (86% and 69.8% respectively) while almost half have an addiction to a drug or medication (46.5%).

Regarding the rate of depression for our sample, the results showed that 79% had definite symptomatology with a statistically significant relationship to medication or drug addiction ( $p=0.017$ ). On the other hand, our study showed that among the 43 patients, 83.7% had a definite anxiety symptomatology with a statistically significant relationship with alcohol dependence ( $p=0.032$ ).

### 4.2. Strengths and Weaknesses

The interest of this work lies in the presence of a reduced and limited number of information and studies in Tunisia and in the



world, which treat the subject of the consumption of methanol. In Tunisia, and to the best of our knowledge, there is no work in the published scientific literature on this subject.

This study developed following the accident of involuntary collective acute intoxication with methanol in Hajb El Ayoun in May 2020 and including 43 patients, can be considered as a representative sample and can thus be compared with the trends in the world to give an opinion on the epidemiological aspects and the psychological state of these candidates.

The main criticism of our study was the absence of scales to objectively explore the environment and the psychological state of its candidates during their young age, at a distance from the period of methanol intoxication.

Self-reporting has its weaknesses, however, namely reporting bias, which is one of the main limitations of this type of study. For self-reported measures, the limitations of subjective understanding could not be denied. The questionnaire is somewhat lengthy and the participant may lose interest and not answer questions accurately.

#### 4.3. Epidemiological Profile

Our results showed that the patients were exclusively male. This difference in distribution is also present, but less evident in other countries with different cultures such as France. Thus CHAKROUN et al. in a study of the frequency of PAS consumption and psychopathology in young adults in their first year of university in France in 2007 showed that the prevalence of female consumption of cannabis and alcohol was respectively 9.3% and 10.5% [11].

The average age was  $28 \pm 3.2$  years. The age group under 25 years was the most represented in our sample, it constituted 51.2% of the patients. This can be explained by the simplicity and ease of access to illicit PAS among these young people easily influenced at this age.

The average age of onset of PAS consumption was 16 years. According to a review of the literature, the risk of dependence in adulthood for alcohol appears to be highly dependent on the earliness of initiation. There is a very high risk of dependence for initiation of consumption before the age of 14 [12]. This hypothesis was confirmed in the work of the "National Survey on Drug Use and Health (NSDUH)" in the United States in 2004 [13]. Moreover, according to the work of DEWIT et al, adults over 21 years of age, considered to be alcohol dependent, were questioned about their first use [12]. A first contact with alcoholic products before the age of 10 years multiplies by 7 the risk of alcohol dependence in adulthood.

In fact, the National Household Surveys on Drug Abuse (NHSDA) study and the Family Study of alcoholism have also shown other risk factors for addiction, objectified to varying degrees in our study, in particular the existence of abuse or harassment in childhood and poor social and economic levels [14,15].

We also noted that 97% of the patients were illiterate or had a primary/secondary education, which may explain why 94% would not have a high school diploma or a vocational training diploma. According to our results, 60.98% of the candidates had not received any advice or family guidance on the harms of drugs and 79.5% of the candidates confirmed that they had never seen commercials, awareness campaigns or documentaries on the harms of PAS.

The lack of awareness of the dangers of PAS in our study environment and the high rate of illiteracy among candidates and parents could explain this high proportion of PAS consumption. This observation has been concluded by several studies in the literature such as the work of Laura B. and Isabelle V. on the family environment and the use of PAS in adolescence which confirmed that the influence of parents plays a crucial role in risky drug use in adolescence [16]. The context of protective family dimensions is also described. Thus, parental supervision of the young person, clear family rules, a low level of family conflict, as well as good communication between children and parents are protective dimensions with regard to the use of PAS.

On the other hand, the patients live mainly in a rural environment, which contradicts the literature. Indeed, according to the work of GOURANI.M in 2007 studying the epidemiology of addiction in a university environment in Marrakech, the origin of the participants is not correlated with the consumption of PAS, and according to the work of OUIIMIDI, the habitat environment may not influence the rate of consumption of PAS, but rather it has an impact on the substance choice, which was in our case, methanol based eau de parfum (92.9%) [17,18].

Moreover, we find that 80% of the participants were unemployed. Our results are contradictory with the literature which shows that the highest rate of tobacco, alcohol and cannabis consumption was noted among participants whose monthly income is higher than the average population, in the same sense, according to OUIIMIDI, the highest rate of PAS consumption is found among the candidates with an average income [18]. This is why our population had a majority consumption of eau de parfum which is available at low prices.

This seems to be comparable with the literature in general, among others, to the works elaborated in an underprivileged socio-economic environment, such as in the study of GARANET which showed that all the adolescents consumed alcohol, tobacco and sniffing glue [19]. In addition, some used gasoline (17/31), cannabis (4/31) and injection drugs (2/31). Thus, the availability of methanol based eau de parfum in this environment, without control by state authorities or family, fosters an environment that encourages the consumption of these products and could explain this methanol intoxication.

The 2016 World Drug Report elaborated by the UNODC (United Nations Office on Drugs and Crime) confirms that the differences in socioeconomic affluence from one country to another also have consequences on the type of drugs consumed, more generally, there is a strong correlation between socioeconomic

difficulties and drug use disorders [20]. This same relationship is found in relation to the various repercussions of marginalization and social exclusion, such as unemployment and low level of education.

The first contact with PAS was mainly in the neighborhood in 73.33% of cases. According to other studies such as that of OULMIDI, 53% of the candidates would have initiated the use of PAS with a friend, against 24% by a colleague at school or at work and 23% alone [18]. Thus 77% of the candidates in OULMIDI's sample would have started their use through a third party and only 23% in a solitary way which concludes that the social framework and the contacts close to the teenager can initiate addictive conduct disorders [21]. The study of GOURANI finds also similar results by demonstrating that the behavior of PAS users was strongly influenced by that of their friends [17]. Thus, 72.8% of tobacco users were initiated by a friend, the same for the consumption of hashish (70.7%) and alcohol (79.5%). Similar results were reported by OULAADA where 83.3% of PAS users initiated their consumption with their friends against only 6% on their own initiative [22].

#### 4.4. Prevalence of Substance Use

Our study found a probable rate of alcohol dependence in 86% of the study population. According to the literature, our results are similar to studies about the use of PAS in a comparable setting. OULMIDI showed that 75% of the participants had alcohol dependence of varying degrees: 23% had a mild addiction, 25% a moderate addiction and 30% a severe addiction [18].

Our results are also comparable with the results of OULMIDI in Morocco who showed that 77% had an addiction to Cannabis to varying degrees; 22% a mild addiction, 34% a moderate addiction and 22% a severe addiction [21]. Indeed, cannabis is the most frequently consumed PAS worldwide, especially in the 15-25 age group [23]. In France, according to the 2011 survey (Survey on Health and Consumption during the Call to Defence), 44% of boys and 39% of girls reported having used cannabis at least once in their lives, 6.5% of them reported having used it between 10 and 29 times in the month preceding the survey and 3% daily [24]. The average age of first use was 15 years. In addition, use decreases sharply after the age of 30.

Regarding addiction to a drug or medication, 46.5% of patients have this type of addiction and 11.6% have a problematic use of drugs or medication. In fact, several studies have looked into this subject and found that the availability of drugs and the way they are sold influence the choice of the type of drug [25]. In the United States, for example, methamphetamine was once manufactured by biker gangs or by individuals with laboratories and were sold mainly in affluent areas. In the mid-1990s, Mexican drug traffickers began to manufacture and distribute methamphetamine through the same channels as marijuana throughout the country, transforming patterns of use in other, less affluent regions [25]. The prevalence of drug addiction in our study area can be explained by the lack of availability of these products compared to the relatively cheap eau de parfum.

## 5. Anxiety and Depression Co-Morbidity

### 5.1. Depression

In our study, 79% of the participants had a definite depressive symptomatology, these results seem to agree with those of OULMIDI who showed that 26% of the population studied in his works presented signs of light depression, 12% a moderate depression and 10% a severe depression. In the same framework, the study of VAN HASSELT et al, carried out among adolescents in detoxification treatment, showed a significant relationship between multiple drug use and a depressed mood [21,26]. Moreover, the statistically significant association ( $p=0.017$ ) between the existence of a definite depressive symptomatology and an addiction to a drug or a medication seems comparable to the results of the work of OULMIDI in Morocco which showed an important comorbidity of depression when the notion of drug addiction was present (78%) and the degree of depression seems to evolve in the same direction as the degree of addiction [21].

Numerous studies suggest that depression precedes substance abuse and is therefore a primary depression. From a sample of 1,037 children followed from birth to the age of 15, Henry found that a depressive episode at the age of 11 was predictive of drug use at the age of 15, but only in boys [27]. In the work of BROOK, they confirmed the association of a depressive symptomatology in teenagers with a later use of drugs and they consider that this use of substances temporarily allows to reduce the dysphoric or depressive mood [28]. Thus, it can be suggested that the high rate of depressive symptoms in our candidates preceded the onset of PAS use, essentially that responses assessing wellbeing during childhood reflected the presence of feelings of sadness during this period. Therefore, it seems to be a "primary" depression symptomatology.

### 5.2. Anxiety

Studying anxiety symptoms, our study showed that among the 43 patients 83.7% had definite anxiety symptomatology. Among the respondents to our scales, there was a statistically significant association ( $p=0.032$ ) between candidates with definite anxiety symptomatology and alcohol dependence.

Indeed, many recent studies have shown significant relationships between anxiety disorders and risky alcohol use [29]. The relationship and implications of these correlations remain, however, largely debatable [30]. The three perspectives invoked are either that anxiety would cause the alcohol use disorder, or that alcohol use would cause the anxiety disorder, or that there is a third shared factor causing both disorders. This last hypothesis can be explained by the multiplication of factors, such as genetic, environmental and socioeconomic factors, which promote comorbidity between the two disorders [31-33].

The results of studies on the comorbidity between alcohol dependence and anxiety reported by MERIKANGAS et al agree with the hypothesis that family environment with high rates of anxiety disorders in close relatives of alcohol users leads to the development of dependence to this substance [34]. Woodward and Fergusson did not find an association between anxiety reported in adolescence and the prevalence of alcohol

dependence later on [35]. Their data suggest that the high rates of alcohol use disorders are a consequence of environmental risk factors and life circumstances associated with anxiety disorders rather than the direct effects of early anxiety. In the same framework, and referring to the data of the Sociodemographic

profile of the patients of our study (family harassment, depressive mood during childhood, poor socioeconomic situation), we can put the hypothesis that the high rate of alcohol dependence and consumption of methanol can be essentially due to anxiogenic risk factors essentially environmental.

	n	Anxiety					Depression				
		Yes		No		p	Yes		No		p
		n	%	n	%		n	%	n	%	
Alcohol addiction	37	31	83.8	6	16.2	0.032	29	78,4	8	21,6	0,082
Drug and medication dependency	20	16	80	4	20	0.063	16	80	4	20	0,017
Cannabis addiction	31	26	83,9	5	16.1	0,914	24	77,4	7	22,6	0,69

**Table 3: Association between Anxiety/Depression and Addiction to PAS (n=43)**

On the other hand, a study carried out by CHRISTIE.A et al. on 4,778 young adults aged 18 to 30 years showed that a history of anxiety disorders doubled the subsequent risk of drug abuse [36]. When DEYKIND et al showed in 424 adolescents aged 16 to 19 years from a general population, a prevalence of alcohol abuse is 8.2% and drug abuse is 9.4% [37]. Among the cases of alcohol abuse, 5% had phobic disorders, and among the cases of drug abuse, 8% had anxiety disorders: 5% phobic disorders and 3% obsessive-compulsive disorders.

More recently, WILENS et al have underlined the links between anxiety disorders and drug use. The anxiety disorders involved are social phobia, panic disorder, generalized anxiety, agoraphobia and separation anxiety [38]. According to the author, the influence of anxiety disorders on PAS use varies according to age. Anxiety disorders would have a "protective" effect during childhood whereas they would be considered as risk factors during adolescence. Thus, anxiety disorders generally occur before PAS use, whereas their coexistence increases the risk of substance abuse and dependence [39,40].

### 5.3. Recommendations

The development of new strategies to prevent the onset of addictive and psychiatric disorders requires multidisciplinary collaboration. For this reason, we propose some recommendations that can be implemented to achieve these goals. First, the establishment of an addiction treating center that will initiate and accelerate physical and psychological recovery process of patients. In addition, it will allow to maintain long term recovery by ensuring a specialized and continuous follow-up. Secondly, the fight against the abuse of PAS through primary prevention by multiplying awareness campaigns in schools, advertising on the complications and risks of the use of these products via media platforms and on social networks. Finally, a legal control of alcoholic products seems a probable solution to fight against the consumption of clandestine and quite dangerous methanol based eau de parfum.

### 6. Conclusion

Our study allowed us to conclude that our patients had a manifest anxiety as well as a depression of severe intensity and a dependence to the PAS in particular the methanol based eau

de parfum which was available at low prices for this category of young people by putting in consideration the implication of the existing epidemiological factors which certainly will worsen the situation. This incites us to put in place a preventive as well as curative strategy engaging the multiple disciplines within the society for the purpose of a better quality of life including a better mental health.

### Statement of Ethics

This study was conducted following the ethical standards of the Declaration of Helsinki, and the confidentiality of patients' data was respected. Written informed consent was obtained from the participant.

### Patient Consent

The patient has given consent for possible publication of this case report.

### Author Contributions

All the authors contributed to the study's development. All the authors have reviewed the statistical analysis and validated the manuscript's final version.

### Data Availability Statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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