

Epidemiologic profile and triggering factors of voluntary poisoning in teenagers

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Abstract

Self-poisoning is an important medical and social problem in adolescents.

We performed an observational cross-sectional retrospective study on a group of 219 adolescents admitted for voluntary intoxications at “St. Mary” Children’s Emergency Hospital, Iasi during 1 year period. Epidemiological aspects and triggering factors have been analyzed. Data collected from the patients’ files were centralized in an SPSS 18.0 database and processed with confidence interval of 95%.

We found that pharmaceutical drugs have been usually involved (34.7%), mostly in girls (56.3% vs. 15.5%; $P=0.0001$). The most frequently cited reason for poisoning was family conflict, with a relative risk (RR) 1.43 times higher in girls, as well as scholar conflict (RR = 1.39). A great percentage of the monitored girls presented severe depression (23.3% vs. 6.9%; $P=0.001$), with an RR more than 3 times higher than in the case of boys. All cases evolved favorably, no death having been recorded, even if 18 teenagers initially presented an extremely serious condition, being admitted in various stages of coma (Glasgow coma scale score < 8).

We found that self-inflicted poisonings with pharmaceutical drugs was more common in girls and the use of drug and alcohol intoxication was found especially in boys. The most common pharmaceutical drug involved in self-poisoning was acetaminophen. Psychological disorders and family or school conflicts are the most important triggering factors of voluntary poisoning. Risk factors should be identified after stabilizing the patient, and actions should be taken in order to prevent a fatal recurrence.

Abbreviations: CI = confidence interval, RR = relative risk.

Keywords: intoxication, suicide attempts, teenager, voluntary poisoning

1. Introduction

During adolescence, children undergo rapid physical, mental, and emotional changes, and thus become prone to risk-taking behaviors such as voluntary poisonings.^[1,2] Voluntary poisoning has been defined by the World Health Organization multicenter study on parasuicide as an act with a nonfatal outcome in which an individual deliberately ingests a substance in excess of the prescribed or generally recognized therapeutic dosage.^[3]

Self-poisonings in adolescents are similar to those in adults. The significance of the event may vary by age, but the risk assessment in emergency units is usually identically.^[4] According to the annual report of the American Society of Toxicology Centers, the children in the 10 to 19 years age group presenting to

the hospital with intentional ingestions can be divided into 3 categories: voluntary abuse, intentional misuse, and suicide attempt.^[5] The clinician must address these situations as medical emergencies. There is a tendency to underestimate the importance of voluntary poisoning in adolescent because usually it is not fatal.^[4]

A triple assessment must be carried out in voluntary poisoning: somatic, psychological, and social. The initial somatic examination will assess the immediate severity of the poisoning in order to apply an appropriate treatment (possibly cure). The psychological evaluation should begin as early as possible, as soon as the patient’s state of consciousness permits. This evaluation should analyze the history and identify risk factors leading to relapse and the existence of underlying conditions, particularly depression. The social assessment must be carried out with the participation of a social care team, comprising the patient’s familial, scholar, and educational context.^[6]

There is a little literature describing the epidemiology of acute poisoning and intoxication among adolescents. The aim of this study was to analyze the epidemiological profile and to identify the triggering factors of voluntary intoxications and poisonings in adolescents admitted at “St. Mary” Children’s Emergency Hospital, Iasi during the period of 1 year.

2. Patients and methods

We performed an observational cross-sectional retrospective study on a group of 219 adolescents with voluntary poisoning, admitted at Regional Center of Toxicology in “St. Mary” Children’s Emergency Hospital, Iasi during 2014. In our patients, poisonings included pharmacological drugs, alcohol

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intoxication, chemical substances, and maladaptive effects of illicit drugs. Data were obtained from the patient's files. We assessed the following factors: sociodemographic data, educational status, the substance used, the motivation for overdose, psychiatric problems, and the outcome of poisoning. During admission, these patients had received psychosocial assessment by a psychiatrist, a psychologist, and a social worker. Diagnosis of depression was established by the psychiatrist according to standard DSM-IV criteria for major depressive disorder, through structured clinical interview, questioning both the teens and their parents or other caregivers. The psychiatric examination in children with coma was performed when the patients were fully aware (Glasgow score 15). The patients who could not be subjected to psychological and psychiatric examinations at the time of their admittance, according to the Toxicology Department's protocol, were excluded from the study.

We refer to poisoning as the consumption of some substances with an intentional aim to self-harm (e.g., pharmaceutical drugs). Similarly, we refer to intoxication as excessive ingestion of some substances otherwise not harmful in habitual behavior (e.g., alcohol). Demographic distribution in rural or urban areas refers to the residence of the children.

All statistical analyses were performed using Statistical Package for Social Science (SPSS), version 19 for Windows. The results have been reported as mean \pm standard deviation for normally distributed variables. Discrete variables were expressed as number and proportion. Groups' comparison for categorical data was performed by Chi-squared test and relative risk (RR) was calculated. Statistical significance was set for a P value <0.05 . The study was approved by the Ethics Committee of our hospital.

3. Results

During the mentioned period, we analyzed 219 adolescents with voluntary poisonings and intoxications. Sex distribution was 53% (116) boys and 47% (103) girls. The mean age was slightly lower in girls, but not statistically significant (16 ± 2.05 years in boys and 15.5 ± 0.7 years in girls). Poisonings were more prevalent in summer and autumn, approximately 60% of all events.

The agents used to commit poisoning, in order of frequency, were pharmaceutical drugs, alcohol, illicit drugs, caustics, and insecticides–raticides (Table 1).

We noticed that pharmaceutical drugs were the most involved in self-poisoning, 34.7% of total cases, mainly in girls (56.3% vs. 15.5%; $P=0.0001$), with an RR 3.63 times higher than in males. Poly-pharmaceutical drug intoxications were present in 24 cases

(31.5%). Regarding the poisoning with a single type of medicine, we found that the most frequently involved were paracetamol (acetaminophen)—23.1% (12) of cases, benzodiazepines—19.2% (10) of cases, antiepileptics—15.4% (8) of cases, and antibiotics—13.5% (7) of cases. Others drugs involved in self-poisoning were hydrazide and ibuprofen (4 cases each); tricyclic antidepressants (2 cases); and antipsychotics, iron salts, anti-Parkinson agents, mineral supplements, and calcium salts (1 case of each). We encountered mild, as well as severe cases of acetaminophen poisoning, the median (min–max range) of liver transaminase being 543 UI/L (72–1866 UI/L) for alanine aminotransferase and 214 UI/L (46–428 UI/L) for aspartate aminotransferase.

Acute ethanol intoxication was encountered in 32.4% of cases, especially in males (77.4%), with an RR 3.05 times higher than in females, and in rural areas (Table 1). The average blood alcohol level at admission in the emergency unit was slightly higher in boys (3 ± 0.77 g‰ vs. 2.5 ± 0.61 g‰ in girls). The highest alcohol level encountered was 5.07 g‰ to a 17-year-old teenager admitted with alcoholic coma.

Acute voluntary illicit drug intoxications were not only important (20.5%), but also more common in boys, with an RR 3.55 higher than in girls. The most common drugs were those involving so-called “ethnobotanical substances” (68.8%), while the frequency of high-risk drugs intoxications was lower (31.2%). In our study, 7 teenagers were chronic users of ethnobotanics. Self-poisoning with caustics and insecticides were rare, but potentially serious, and both were more common in women.

Drugs voluntary poisoning was more frequently encountered in rural areas (38.1% vs. 28.8%), but without statistical significance; however, voluntary illicit drugs' intoxications were significantly more common in urban areas (30% vs. 15.1%; $P=0.009$), with an RR 1.99 times higher than in rural areas. Regarding ethanol, caustics, and insecticides–raticides poisoning, there were no significant differences between rural and urban areas.

The most common given reasons for poisoning were family and school conflicts, with 24.7% of cases and 13.2% of cases, respectively. We noticed that both family and school conflict triggered voluntary poisoning in girls more often than in boys, but the differences were not statistically significant (Table 2). The desire for group integration was significantly more frequently invoked in boys ($P=0.001$), with RR over 4 times higher than in girls (Table 2). Less frequently identified reasons for poisoning were conflict with partner, curiosity, defiance, demonstration purpose, festive events, victim of aggression, and the failure of attempts to lose weight in 2 girls (Table 2). In 16% of cases, teens

Table 1

Comparison between the agents involved in accordance with gender and background.

Poison	Male, N (%)	Female, N (%)	χ^2	P	RR	95% CI	Urban, N (%)	Rural, N (%)	χ^2	P	RR	95% CI
Pharmaceutical drugs	18 (15.5)	58 (56.3)	39.90	0.0001	3.63*	[2.30; 5.73]	23 (28.8)	53 (38.1)	1.93	0.16	1.32	[0.88; 1.98]
Ethanol	55 (47.4)	16 (15.5)	25.23	0.0001	3.05†	[1.87; 4.98]	24 (30)	47 (33.8)	0.33	0.564	1.12	[0.74; 1.69]
Insecticides and raticides	3 (2.6)	9 (8.7)	3.90	0.048	3.38	[0.97; 12.14]	4 (5)	8 (5.8)	0.06	0.803	1.15	[0.36; 3.70]
Caustics	4 (3.4)	11 (10.7)	4.54	0.033	3.10*	[1.02; 9.43]	5 (6.3)	10 (7.2)	0.06	0.800	1.15	[0.41; 3.25]
Illicit drugs	36 (31)	9 (8.7)	16.56	0.0001	3.55†	[1.80; 7.01]	24 (30)	21 (15.1)	6.87	0.009	1.99	[1.18; 3.33]

CI = confidence interval, RR = relative risk.

$P < 0.01$.

* Increased relative risk in girls.

† Increased relative risk in males.

Table 2**Motivation of poisoning, detected by the psychological examination.**

Purpose/motivation	Cases		χ^2	P	RR	95% CI
	Male, N (%)	Female, N (%)				
Family conflict	24 (20.7)	30 (29.1)	1.85	0.174	1.43*	[0.90; 2.28]
School conflict	13 (11.2)	16 (15.5)	0.55	0.457	1.39*	[0.70; 2.74]
Conflict with boyfriend/girlfriend	2 (1.7)	8 (7.8)	3.29	0.033	4.50*	[0.98; 20.73]
Curiosity	3 (2.6)	4 (3.9)	0.03	0.873	1.50*	[0.34; 6.75]
Rebellion	8 (6.9)	2 (1.9)	2.04	0.153	3.55	[0.77; 16.35]
Demonstrative	3 (2.6)	8 (7.8)	2.08	0.149	3.00*	[0.82; 11.02]
The desire for group integration	30 (25.9)	6 (5.8)	14.52	0.001	4.44†	[1.93; 10.24]
Festive	5 (4.3)	7 (6.8)	0.26	0.611	1.58*	[0.52; 4.82]
Aggression victim	2 (1.7)	5 (4.9)	0.86	0.353	2.82*	[0.56; 14.20]
Failure attempting to lose weight	—	2 (1.9)	0.63	0.426	—	—
Suicidal	2 (1.7)	6 (5.8)	1.57	0.210	3.38*	[0.70; 16.37]
Unidentified	24 (20.7)	9 (8.7)	5.19	0.023	2.37†	[1.15; 4.86]

CI = confidence interval, RR = relative risk.

P < 0.01.

* Increased relative risk in girls

† Increased relative risk in males.

came from dysfunctional families, 4% were cared by their grandparents and 6.4% of cases were institutionalized children.

Suicidal purpose was confessed only in 6 cases in girls and in 2 cases in boys. No triggering factor has been identified in a large percentage of the cases, especially in boys (20.7% vs. 8.7%; $P=0.023$). Eight teenagers committed self-poisoning twice, 4 teens did it for the 3rd time, and 1 case was admitted at his 4th attempt.

We found that voluntary poisoning RR was slightly higher in boys presenting emotional and/or conduct disorder (RR=1.33) or adjustment disorder (RR 1.5 times higher than in girls). It was noticeable that an important percentage of adolescent girls had severe depression (23.3% vs. 6.9%; $P=0.001$) with an RR more than 3 times higher than in boys.

Suicidal ideation or autolysis was more frequently encountered in girls and even though the percentage differences were not statistically significant; it was noticed an RR 3.38 and 2.82 times, respectively, higher than in boys. Many patients had no psychiatric disorder, but the percentage of boys who did not have any mental disorder at the time of examination was significantly higher than that of girls (52.6% vs. 34%; $P=0.008$) (Table 3).

It was found that most teenagers who presented with voluntary poisoning had no school problems (71.7%). Yet some of them

faced dropout (12.8%), absenteeism (9.13%), repeaters (4.1%), or expulsion (5 cases) (Table 4).

The outcome was favorable in all cases; no decrease having been recorded. Nevertheless, it has to be noted that 8.4% of teenagers initially presented an extremely serious condition, being admitted in various stages of coma (Glasgow score < 8). Clinical manifestation associated with voluntary poisoning were traumatic cranial and brain injury by falls in 8 cases and 7 cases presented self-harm signs (sectioning veins).

4. Discussion

Self-poisoning, the most common method of self-inflicted injuries and attempts to suicide among adolescences, represents a public health problem in industrialized countries.^[7,8] Self-inflicted injuries and suicide are both preventable. Therefore, it is important to identify the risk factors and predictors in order to insure proper preventive care.

We analyzed the adolescents admitted in a Regional Center of Toxicology, where patients are sent from the northeast part of Romania. This is the first study that analyses the epidemiological issue of voluntary poisoning and intoxication in a representative cohort for this region.

Table 3**Neuropsychiatric disorders detected.**

Disorders	Cases		χ^2	P	RR	95% CI
	Male, N (%)	Female, N (%)				
Mixed and conduct disorder (behavior/emotional)	18 (15.5)	12 (11.7)	0.40	0.526	1.33	[0.67; 2.63]
Adjustment disorder	22 (19.0)	13 (12.6)	1.20	0.274	1.50	[0.80; 2.83]
Depression						
Severe	8 (6.9)	24 (23.3)	10.49	0.001	3.38*	[1.59; 7.19]
Dysthymic disorder	3 (2.6)	8 (7.8)	2.08	0.149	3.00*	[0.82; 11.02]
Suicidal ideation	2 (1.7)	6 (5.8)	1.57	0.210	3.39*	[0.70; 16.37]
Autolytic ideation	2 (1.7)	5 (4.9)	0.86	0.353	2.82*	[0.56; 14.20]
No mental disorder at the time†	61 (52.6)	35 (34.0)	6.93	0.008	1.55	[1.12; 2.13]

CI = confidence interval, RR = relative risk.

P < 0.01.

* Increased relative risk in women.

† Increased relative risk in males.

Table 4**School characteristics of the study group.**

School characteristic	Cases		χ^2	P	RR	95% CI
	Male, N (%)	Female, N (%)				
Absenteeism	12 (10.3)	8 (7.8)	0.18	0.670	1.33	[0.57; 3.13]
Repeaters	6 (5.2)	3 (2.9)	0.25	0.617	1.78	[0.46; 6.92]
Expulsion	4 (3.4)	1 (1.0)	0.60	0.440	3.55	[0.40; 31.27]
School drop	18 (15.5)	10 (9.7)	1.17	0.279	1.60	[0.77; 3.30]
No school problems	76 (64.4)	81 (78.6)	4.01	0.045	1.20*	[1.02; 1.42]

CI = confidence interval, RR = relative risk.

P < 0.01.

* Increased relative risk in women.

According to the literature, one of the main risk factors in self-poisoning is female gender, due to the facts that girls consider suicide more frequently during adolescence.^[9,10] However, a slightly predominance of boys is observed in our study. According to the literature,^[11] self-inflicted poisonings with pharmaceutical drugs were more common in girls. Instead, the use of drug and alcohol intoxication was found especially in boys.

In our study, the most common agents involved in deliberate self-poisoning were pharmaceutical drugs. Other studies recorded a greater percentage of self-poisoning involving medicines, reaching 84.5%^[12] or even 97.8%.^[13] Also, many patients presented with polydrugs poisonings. The drugs most frequently involved in self-poisoning are different from one country to another and from one toxicology center to another, depending on drugs prescription, their availability and accessibility, and the purpose of poisoning. Similarly to the results of a recent prospective study conducted in France,^[14] we found that the most common pharmaceutical drug involved in single-drug self-poisoning was acetaminophen. Studies carried out in United States also report analgesics (acetaminophen and nonsteroidal anti-inflammatory) as most commonly involved in intentional poisoning attempts, followed by sedative/hypnotic and antipsychotic drugs.^[5,11,15] Literature data suggest that substance use is a powerful independent risk factor for self-inflicted injury and suicidal behavior.^[16]

Some studies underline the importance of including alcohol intoxication and maladaptive effects of drugs in the spectrum of adolescent poisoning, given that they can be an important cause of death.^[11] Ethanol poisoning was one of the most frequent cause of intoxication. Considering that this study included only hospitalized cases, we may think that the frequency of ethanol intoxication is even higher among teenagers, because the mild forms were not admitted. Some studies performed in other countries show that the child's age for his first alcohol ingestion has declined in recent years. Thus, a French investigation showed that 59% of children ages 11, 72% of children ages 13, and 84% of those ages 15 have already drunk alcohol at least once.^[17] In our cohort, the youngest patient with ethanol intoxication was 12.7 years old. The ethanol intoxication was more frequent in rural areas due to alimentary behaviors, parents' examples, and the greater availability of ethanol products, especially in autumn, in this region.

In our study, the most common acute voluntary drug intoxications were those involving the improperly called ethnobotanic substances. The products dubbed ethnobotanic are used for their psychoactive and physiological effects which resemble that of classic drugs; they contain chemical substances or mixtures of vegetal and chemical substances and are sold on the internet and smart shops/head shops. They are commonly

consumed as cigarettes or joint and are known as novel psychoactive substances (designer drugs).^[18] Marijuana and methamphetamine are the most commonly used illegal drugs in industrialized countries. The socioeconomic status in middle-income countries like Romania may be the reason for the more frequent use of ethnobotanic substances compared with other countries.

The real reasons behind self-poisoning may be difficult to assess in teenagers. Family and school conflicts were the most frequent causes stated by our patients. Studies suggested that an authoritative parenting or rejecting-neglecting parenting style associated with lack of affection (inflexible families) generates risk for suicidal thoughts and attempts in adolescence.^[19] These studies also identified some other familial risk factors, such as absenteeism, parental separation events, and migration background.^[19] An important percentage of adolescents in our study came from dysfunctional families or were raised by their grandparents, as their parents work in other countries. Growing up without their parents became an important issue in the determinism of children behavioral disorders in the last decade in Romania. Also, school failure itself is not a triggering factor, but the association with academic pressure, personal dissatisfaction due to school results and lack of social/family support may cause suicidal behavior.^[20]

Underlying psychiatric illness confers a significant risk for committing self-harm and can promote the transition to a suicidal act and to relapse. The presence of a psychiatric disorder multiplies by a factor of 11 to 27 the risk of suicidal attempt over the general population.^[21] In our study, around half of the children had mental health issues. Out of these, a third accounted for depression, making them extremely susceptible to suicidal attempts. Depression was found in 31% of girls, with a 3 times higher RR for voluntary poisoning in girls than in boys. The rates of depression increase greatly during adolescence to reach a prevalence of around 1% in boys and 2% in girls.^[22] Our results are similar with those in the literature, indicating that females are at risk for traditional suicidal ideation/depression measures, whereas risk-taking behaviors (alcoholism or drug abuse) are more common in males.^[15] In our patients, suicidal ideation was assessed by a psychiatrist communicating with the patients, taking into account the adolescents' psychosocial factors and history and encouraging them to share their feelings and concerns. Children diagnosed with depression or suicide ideation were transferred into the psychiatric clinic for treatment, after the acute episode. It is important to follow these patients and to give a specific treatment, in order to avoid repeated episode of suicidal attempts.

Only a few patients of the study group confessed the suicide attempt. For a lot of them, poisoning had only a demonstrative

purpose, or it was meant as a call for help or a resumption of dialog, but the passage to an act should not be neglected. Some authors opined that it is hard to distinguish between suicide attempter's adolescents and at-risk adolescent, suicide attempts being "one point on a continuum of adolescent problem behaviors."^[23] Physiological counseling and personal approach in accompanying patients to overcome suicidal ideation should be a priority to the healthcare providers.

This study has some limitations. It included only children with voluntary poisoning admitted in a tertiary hospital from the northeast part of Romania; mild poisoning cases who did not need hospital care were excluded, as well as patients without a psychological and psychiatric examination. Due to these limitations, we cannot estimate a rate of adolescent poisoning and the presented result are not representative of all self-inflicted poisoning cases among adolescents in Romania. The incidence of alcohol and ethnobotanic substances intoxication is higher in general population, if we consider also the less dramatic cases, but without differences in terms of gender or demographic distribution from severe cases. Further detailed studies on screening and surveillance, with focus on the circumstances of poisoning and motives, are needed.

5. Conclusion

In adolescence the risk of voluntary poisoning is higher. We found that self-inflicted poisonings with pharmaceutical drugs were more common in girls and the use of drug and alcohol intoxication was found especially in boys. The most common pharmaceutical drug involved in single drug self-poisoning was acetaminophen. Family or school conflicts and emotional and/or conduct disorders were the most important triggering factors of voluntary poisoning.

Our findings emphasize the need for sustained and focused prevention efforts. Triggering factors and adolescents with suicidal risk should be identified in order to avoid fatal events. Familial factors have to be carefully considered, because they play an important role in the process of personality development in adolescents.

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