

ORIGINAL ARTICLE

Voluntary pharmacological drug poisoning in 267 adolescents

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Abstract. *Background and aim:* Adolescence, a period of biopsychosocial change, is particularly vulnerable to unsafe behaviors such as voluntary drug poisoning (VDP). The main objective of this study was to characterize the epidemiology, clinical characteristics and management of admissions due to VDP in a Pediatric Emergency Department in Lisbon. *Methods:* Retrospective study between January 2015 and December 2022 by reviewing computerized inpatient records of all admissions of children up to 18 years old due to VDP. *Results:* During the study period, a total of 267 admissions were identified, with a predominance of female gender and a median age of 16 years. Regarding personal history, 83.1% of adolescents had a psychiatric disorder, and 74.8% of these individuals were receiving medication. Approximately 39% had experienced at least one previous episode of VDP. Half of the patients were symptomatic upon admission, with neurological manifestations being the most common. Among the medications involved, acetaminophen was the most frequently identified (23.6%), and within the pharmacological classes, antipsychotics were the most commonly used (29.6%), followed by benzodiazepines and antidepressants. Interventions in the Emergency Department included activated charcoal, gastric lavage and specific antidotes targeted at the ingested toxin. The primary precipitating factors were family conflicts, conflicts with a partner and bullying. *Conclusions:* There is a significant association between VDP and psychiatric disorders. The high prevalence of medication use among these patients emphasizes the need for close monitoring of those undergoing pharmacological treatment. The identified triggering circumstances underscore the critical role of psychosocial factors, highlighting the importance of targeted interventions (www.actabiomedica.it).

Key words: drug poisoning, adolescent, depressive disorder

Introduction

Adolescence is a critical developmental stage characterized by significant biopsychosocial changes (physical, psychological and social), marking the transition from childhood to adulthood (1). According to the World Health Organization, adolescents are defined as individuals aged 10–19 years. Adolescence can also be understood more broadly as a biological phase marked by the onset of puberty and the progression toward physical maturity, as well as psychological phase characterized by significant emotional, cognitive and

social development (2). This period is often associated with heightened interpersonal stress and emotional reactivity, leading to potentially risky and impulsive behaviors, including voluntary drug poisoning (VDP) (3, 4). VDP involves the intentional ingestion of substances for non-therapeutic purposes, such as self-harm or attempted suicide. According to the World Health Organization (WHO), suicide is the fourth leading cause of death among 15–19-year-olds, with a notably higher prevalence among females (5). International reports indicate VDP is the most prevalent form of self-poisoning in adolescents, with rates ranging from

0.4 to 10.3% (6). Although self-poisoning often results in a low case fatality rate, it serves as a significant indicator of potential future mental health issues (7). Commonly ingested substances in VDP include acetaminophen, ibuprofen, selective serotonin reuptake inhibitors (SSRIs), atypical antipsychotics and antihistamines, with antidepressants and atypical antipsychotics often resulting in severe clinical outcomes or fatalities (8). The complexities surrounding VDP in adolescents have attracted growing clinical attention due to its rising prevalence and serious complications. The COVID-10 pandemic has exacerbated this issue by significantly impacting adolescent mental health. The isolation, disrupted routines, and pervasive sense of uncertainty have contributed to a troubling increase in VDP cases (9). Studies from Romania to Canada during the COVID-19 pandemic have highlighted substantial rises in emergency visits and hospital admissions related to drug poisoning, illustrating the extensive ramifications of this global health crisis. For instance, the rate of suicide attempts via poisoning increased from 40.0% to 66.7% during the pandemic compared to preceding years (6,10).

Despite its significance, the literature on the clinical presentation, outcomes and sociodemographic factors associated with VDP in adolescents remains sparse (6). Understanding these dimensions is essential for developing effective prevention and intervention strategies. This study aims to provide a comprehensive overview of the epidemiology, risk factors, clinical manifestations and management strategies related to VDP in this vulnerable demographic. By highlighting these critical aspects, we aim to enhance both awareness and responses to this urgent public health challenge.

Methods

This retrospective observational study analyzed all admissions to the pediatric emergency department at Hospital Professor Doutor Fernando Fonseca, Lisbon, for VDP from January 2015 to december 2022. The study exclusively included cases of pharmacological drug poisoning, excluding poisonings from other substances such as ethanol, caustics or illicit drugs

and non-voluntary drug ingestion. We meticulously reviewed computerized records of all VDP-related admission during this period. For each admission, we analyzed the following variables: age, sex, personal history including any psychiatric conditions, previous episodes of VDP, clinical symptoms, drugs ingested along with their pharmacological class, motivation behind the poisoning, medical interventions, length of hospitalization, psychiatric assessments and post-discharge outcomes. To provide further insight, patients were categorized into three groups based on the intent of poisoning: suicide attempts, intentional misuse and voluntary abuse. In our dataset of 267 patients, 59% of cases were classified as suicide attempts, 21% as intentional misuse and 20% as voluntary abuse. Statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 23.0. Ethical approval for the study was secured from the hospital's Ethics Committee prior to data collection (reference number 59/2023, 14 July 2023).

Results

A total of 267 admissions due to VDP were identified during the study period. Among these, 88.0% (235/267) were female, with a median age of 16 years (minimum 8 years; maximum 17 years). An analysis of yearly admissions revealed that the highest number occurred in the COVID years of 2021 and 2022 (Figure 1). Regarding personal history, 83.1%

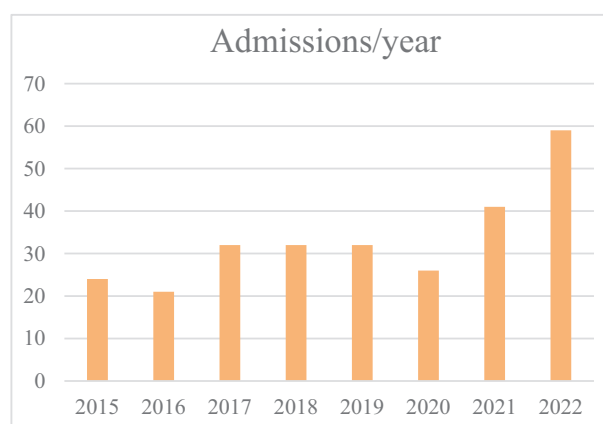


Figure 1. Number of admissions per year.

Table 1. Number of previous episodes of VDP

Previous episodes of VDP	Number of patients
1	46
2	26
3	14
4	3
5	1

(222/267) of patients had psychiatric disorder, with depressive disorder (54.5%, 121/222) and anxiety disorder (19.4%, 43/222) being the most prevalent. Of these individuals, 73.0% received follow-up care in pediatric psychiatry and 74.8% (166/222) were prescribed either antidepressant or antipsychotic medication. Notably, 39.3% (105/267) engaged in self-injurious behaviors, with 15.0% of these individuals lacking mental health follow-up. Additionally, 38.6% (103/267) of patients had experienced at least one prior episode of VDP (Table 1). Upon admission, 53.6% (143/267) of patients exhibited clinical symptoms, with the most common manifestations being neurological symptoms (e.g., lethargy and somnolence) and gastrointestinal symptoms (e.g., nausea, vomiting, and abdominal pain). The majority of patients (80.0%) presented with a normal neurological examination, as indicated by a Glasgow Coma Scale score of 15. In approximately half of the cases (50.6%), more than one drug was ingested. Among the substances involved, paracetamol was the most frequently identified (23.6%). In terms of pharmacological classes, antipsychotics were the most commonly used (29.6%), particularly risperidone, quetiapine and olanzapine, followed by benzodiazepines (27.0%) and antidepressants (21.3%), with sertraline being notable (Table 2). In the majority of cases (59.2%), the ingested drugs belonged to the individuals' regular medication. A small percentage of cases also reported concurrent use of other substances, namely cannabinoids (3.7%) and alcohol (2.6%). Considering that paracetamol was the most frequently identified substance, liver transaminases were analyzed to assess potential hepatic involvement. The median alanine aminotransferase (ALT) was 14 U/L (range: 8-120 U/L) and the median aspartate aminotransferase (AST) was 17 U/L (range: 9-182

Table 2. List of ingested drugs and respective pharmacological class.

Pharmacological class	Number of patients (%)
Antipsychotics	79 (29,6)
Risperidone	30 (11,2)
Quetiapine	26 (9,7)
Olanzapine	16 (6)
Aripiprazole	9 (3,4)
Benzodiazepines	72 (27)
Alprazolam	22 (8,2)
Lorazepam	21 (7,9)
Diazepam	18 (6,7)
Clonazepam	12 (4,5)
Acetaminophen	63 (23,6%)
Antidepressants	57 (21,3)
Sertraline	27 (10,1)
Fluoxetine	12 (4,5)
Escitalopram	10 (3,7)
Paroxetine	5 (1,9)
Trazodone	4 (1,5)
NAIDs	48 (18%)
Ibuprofen	41 (15,4)
Naproxen	3 (1,1)
Metamizole	3 (1,1)
Diclofenac	1 (0,4)

U/L). In the Emergency Department, the primary interventions included the administration of activated charcoal (60.7%) and gastric lavage (61.8%). Targeted antidote therapy was administered in 5.2% of cases, with N-acetylcysteine being the most commonly used antidote. Throughout the study period, five adolescents (1.9%) required admission to the Intensive Care Unit, while three individuals underwent orotracheal intubation (1.1%). One patient required vasopressor support and there was one reported fatality. This case involved a 16-year-old female adolescent who ingested more than six different medications, ultimately resulting in cardiogenic shock and ischemic colitis. The most frequent triggers for VDP included family conflicts (26.2%), conflicts with a partner or breakups (11.2%), and school-related issues, such as bullying (7.1%). Less common reasons included grief, a history of sexual abuse, and medical termination of pregnancy. The average duration of hospitalization was 28 hours, with the majority (91.4%) of patients being transferred to another facility for psychiatric evaluation following the

acute episode. The remaining cases, which were not transferred, primarily involved mild intoxications or children already receiving psychiatric care, scheduled for short-term assessment.

Discussion

This study provides insights into the prevalence and characteristics of VDP among adolescents, emphasizing the implications for mental health and public health responses. Notably, this research reveals a significant gender disparity, with 88.0% of admission involving females. This finding aligns with existing literature indicating that adolescent females are more susceptible to mental health challenges and, consequently, to self-harming behaviors including VDP (3). The higher incidence of voluntary drug poisoning among female adolescents may be attributed to a combination of factors, including heightened societal and emotional pressures, greater prevalence of mood and anxiety disorders, and the tendency for females to internalize distress, which can lead to self-harming behaviors as a coping mechanism during the tumultuous transition from childhood to adulthood. The considerable rise in admissions during the post-COVID years of 2021 and 2022 underscores the profound impact of the pandemic on adolescent mental health. The disruptions caused by lockdowns, social isolation and educational interruptions have likely intensified feelings of anxiety and depression, which were already prevalent among adolescents. This aligns with findings from other studies that reported a marked increase in VDP and suicide attempts during the pandemic. In our study, a striking 83.1% of adolescents had psychiatric disorders, with depressive and anxiety disorders being the most prevalent. Such a high prevalence accentuates the urgent need for integrating mental health services into pediatric care in our country. The fact that 74.8% of these adolescents were on antidepressant and antipsychotic medications suggests that the availability and access to these medications could potentially facilitate their use in self-poisoning episodes. This behavior raises important questions about the management and monitoring of psychiatric treatment among adolescents. While these medications are essential for

managing mental health conditions, the risk of misuse or self-harm poses a critical challenge that needs to be addressed by healthcare providers. Additionally, the finding that 39.3% of individuals engaged in self-injurious behaviors and that 15.0% of them lacked follow-up care is concerning. This highlights significant gaps in continuity of care and underscores the need for systematic monitoring of high-risk patients. A recent review identified several risk factors for anxiety, including adolescence, female gender, lack of routine activities, and repeated exposure to COVID-19 information (6). The clinical manifestations predominantly included neurological and gastrointestinal symptoms, with a majority presenting normal neurological exams. This underlines the complexity and variability of clinical presentation in VDP cases. The use of activated charcoal and gastric lavage as primary interventions aligns with standard practices in the management of drug overdoses. Identifying triggers for VDP can be challenging, as adolescents may not always be ready or willing to disclose the true reasons. However, our study suggests that psychosocial factors, such as family or romantic conflicts and bullying, are significant triggers. The varied motivations for VDP emphasize the multifaceted nature of this issue. These triggers highlight the importance of implementing psychosocial support systems to address familial and interpersonal dynamics that contribute to adolescent distress. The identification of less common reasons, such as grief and sexual abuse, further underscores the necessity for trauma-informed care approaches when dealing with adolescents in crisis. Given the significant role of psychiatric comorbidities as a risk factor, improved access to mental health services at primary healthcare and school levels would be beneficial. The incorporation of mental health screening and services into school health programs could help in early identification and intervention. Adolescents should also be encouraged to establish consistent routines that promote mental well-being, tailored to their interests and motivations. Parental involvement is essential in addressing this issue. One possibly effective strategy would be to provide parents with resources and training aimed at helping them recognize the warning signs of mental health issues and VDP. Equipping parents with tools to engage in open, supportive conversations with their children

about mental health and substance use can foster a healthier environment and facilitate early intervention. Acetaminophen emerged as the most common medication involved, likely due to its wide availability and accessibility. Considering the prevalence of acetaminophen in VDP cases, its easy availability without a prescription at local pharmacies should be reconsidered. Limiting the size of medication blister packs and encouraging parents to keep medications out of reach of adolescents could also help mitigate the risk of VDP.

Conclusion

In conclusion, voluntary drug poisoning (VDP) is the most common method of suicide attempt in the adolescents and poses a significant public health concern. This study highlights the urgent need for improved preventive strategies, expanded mental health services, and enhanced psychosocial support for adolescents at risk. Future research should focus on identifying effective interventions that address both the psychological and social factors contributing to VDP. A deeper understanding of these dynamics is essential for developing comprehensive public health policies aimed at curbing the troubling rise of VDP among adolescents.

Ethic Approval: Ethics permission for the study was obtained from the Ethics Committee of the hospital.

Conflict of Interest: Each author declares that she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: TF and HIA conceptualized and designed the initial study. JVL and FP designed the data collection instruments, collected data and carried out the initial analyses. JVL drafted the initial manuscript. All authors reviewed and revised the manuscript and approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Declaration on the Use of AI: None.

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