

CASE REPORT

Datura poisoning in a family: Case series and literature review

Niloofer Khoshnam-Rad¹  | Marziyeh Heydari¹ | Keyhan Mohammadi¹  |
Mojgan Mashayekhi² | Zahra Sahraei³ | Kheirollah Gholami¹

¹Department of Clinical Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran

²Drug and Poison Information Center, Tehran University of Medical Sciences, Tehran, Iran

³Department of Clinical Pharmacy, School of Pharmacy, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Correspondence

Kheirollah Gholami, Department of Clinical Pharmacy, Faculty of Pharmacy, Tehran University of Medical Sciences, 16 Azar Ave., Enghelab Sq. Tehran 14155-6451, Iran.
Email: khgholami@sina.tums.ac.ir

Abstract

Datura spp. is a potentially poisonous plant that is widely spread and is simply accessible, which can yield poisoning with a central and peripheral anticholinergic effect. We reported cases of family poisoning caused by the herbal tea with refreshing effects that were identified as *Datura spp.*

KEYWORDS

anticholinergic poisoning, *Datura spp.*, toxic plants

1 | INTRODUCTION

Plant and mushroom poisoning is a less investigated area of clinical toxicology. Many plant species are capable of producing toxicity; however, relatively few cases cause severe intoxication. Solanaceae is among the herbal families that contain the highest number of poisonous plant species.¹ *Datura* is a genus of about nine species of poisonous flowering plants in this family. *Datura stramonium* (also known as jimsonweed or thorn apple), the most common species within the *Datura* family, is a weed that may be found along roadsides or meadows.² Traditionally, *Datura* leaves are rolled into cigarettes or smoked in a pipe for narcotic effects or asthma relieving properties.³ Usually, low doses of alkaloids are absorbed by smoking *Datura* species; otherwise, it is considered extremely dangerous.

Intentional abuse for hallucinogenic and stimulating effects is also reported by eating seeds, drinking tea, or smoking cigarettes.⁴

Poisonous *Datura* compounds include tropane alkaloids: hyoscyne, atropine (D, L-hyoscyamine), and scopolamine (L-hyoscyne).⁵ The toxicity mechanism is due to the competitive blockade of acetylcholine at peripheral and central muscarinic receptors. Poisoning symptoms include mydriasis, cycloplegia, dry skin, dry mouth, urinary retention, tachycardia, delirium, and respiratory arrest. Symptoms usually begin within 30 to 60 min of consuming the plants. Effects can last from 24 to 48 h but have been reported to persist for up to 2 weeks. Toxicity management depends on the severity of the symptoms and includes monitoring, supportive care, decontamination, agitation and seizure control, and antidote administration.¹

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Here, we present a case series of *Datura* intoxication in a family after consuming refreshing herbal tea at a family gathering.

2 | CASE PRESENTATION

In June 2020, six members of a family were admitted to the poisoning ward of a teaching hospital affiliated with Tehran University of Medical Sciences in Tehran, Iran. About an hour before admission to the hospital, six members of this family developed symptoms of hallucinations, agitation, and disinhibited behavior (playing with imaginary objects, trying to pick imaginary things off the carpets, trying to throw things out of the closed window). Two of the family members were out for work, and the mother did not take the herbal tea due to illness and concern about drug–herb interactions. These members of the family were asymptomatic and had called the emergency services.

They denied the use of any hallucinogenic substances or recreational drug use. They stated consumption of a decoction that was prepared at home after buying a herbal product from an apothecary (a shop selling medicinal plants). They did not know the name of the product. The seller of this herb had suggested this as an invigorating and refreshing product. The leaves that they brought to the hospital were identified as *Datura*. Four commonly occurring *Datura* species include *D. stramonium*, *D. metel*, *D. innoxia*, and *D. ferox*, of which *D. stramonium* is predominant in Iran. It is not easy to determine the exact species, as they brought product was crushed leaves and stems. So, it has been reported as *D. spp.*

Based on history and physical examination, anticholinergic poisoning was suspected. Acute hypoglycemia, neuroleptic malignant syndrome, hallucinogen toxicity, serotonin syndrome, meningitis, sepsis, and lithium toxicity are among the possible differential diagnosis of the present cases. All were ruled out by appropriate laboratory tests (blood sugar, urine screen, and blood culture tests) and complete medication history.

The clinical information of each case and the treatment measures taken for them are discussed here. Laboratory data at the admission of all patients are summarized in [Table 1](#). A summary of the patients' signs and symptoms and the management are presented in [Table 2](#).

2.1 | Case 1

A 67-year-old male, with no significant medical and drug history, presented with severe agitation that required restraints. On physical examination, symptoms of anticholinergic toxicity were evident. The level of consciousness was slightly depressed. Because of his elevated creatine phosphokinase

(CPK) and lactate dehydrogenase (LDH), there were some concerns about rhabdomyolysis. Myoglobinuria or any indicative symptoms or signs of rhabdomyolysis were not detected. Intravenous fluids and midazolam (0.2 mg/kg) were administered for him. A gradual improvement in his symptoms was observed. He was fully recovered and discharged home after 2 days of hospitalization. His elevated LDH and CPK returned to normal at the time of discharge.

2.2 | Case 2

A 32-year-old female presented with agitation, hallucination, and nausea. She had been diagnosed with depression, but she did not receive any medication for it. On physical examination, her pupils were widely dilated, and her mucous membranes were dry. Supportive treatment, including hydration, ondansetron, and midazolam (0.2 mg/kg), was administered. She received four doses of midazolam, but her agitation did not resolve. She was sedated with intravenous diazepam (5 mg). She was fully recovered and discharged home after 1 day.

2.3 | Case 3

A 38-year-old female presented with agitation, restlessness, and nausea. She had been diagnosed with depression and treated with various antidepressants, which ameliorated but did not cure her condition. On physical examination, her pupils were widely dilated. Arterial blood gas analysis revealed respiratory acidosis. An oxygen mask was applied (4 L/min), and midazolam was administered. Supportive treatment, including hydration and midazolam (0.2 mg/kg), also was administered. She received four doses of midazolam, which did not control her agitation. She was sedated with intravenous diazepam (5 mg). She was fully recovered and discharged home after 1.5 days.

2.4 | Case 4

A 22-year-old female presented with severe agitation, hallucination, and drowsiness. She had been diagnosed with bipolar mood disorder that was controlled with antipsychotics. Her agitation was controlled with intravenous midazolam and haloperidol. She was fully recovered and discharged home after 1.5 days.

2.5 | Case 5

A 15-year-old male presented with severe agitation, dizziness, and hallucination. His previous medical and drug

TABLE 1 Laboratory data of each patient at admission

Test (unit)	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Reference range
SBP/DBP	165/95	140/90	130/85	140/90	130/95	140/80	90–130/65–85
PR (beats/min)	132	135	130	142	134	114	60–100
RR (breaths/min)	18	16	19	16	18	16	12–16
Temperature (°C)	38	37.3	37.1	37.3	38.5	37.8	36.1–37.2
BS (mg/dl)	124	102	93	105	121	115	80–200
WBC (10 ³ /μl)	4.5	8.5	8.7	8.6	10.4	7.4	4.5–11
Hemoglobin (g/dl)	16.3	13.5	14	12.8	12.9	16.3	12–15 (F) 14–17 (M)
Platelet (10 ³ /μl)	169	213	279	247	216	220	150–450
AST (U/L)	46	25	16	23	24	NA	10–40
ALT (U/L)	39	25	12	15	15	NA	7–56
ALP (U/L)	140	124	154	139	NA	NA	45–145
Urea (mg/dl)	34	33	31	24	21	37	15–40
Creatinine (mg/dl)	0.9	0.9	1	0.8	0.8	0.9	0.5–1.4
Sodium (mEq/L)	137	140	141	161	136	145	135–145
Potassium (mEq/L)	4.1	4.2	4.2	4	3.9	4.2	3.5–5.5
CPK	313	119	95	158	95	177	39–300 (M) 26–195 (F)
LDH (U/L)	650	417	356	324	436	531	<480
PTT (s)	28	27	30	33.2	33	28	25–35
INR	0.95	0.94	0.89	1.02	1.13	0.85	0.8–1.2
O ₂ saturation (%)	96	98	93	98	92	97	94–100
pH	7.43	7.39	7.32	7.34	7.33	7.39	7.35–7.45
PaCO ₂	43	39	50	42	60	27	35–45
HCO ₃ ⁻	25	24	27	22	31	21	22–28
Urine screen test for amphetamines, methamphetamines, benzodiazepines, barbiturates, marijuana, PCP, methadone, opioids	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-
Blood culture	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	-
Pregnancy test	-	Neg.	Neg.	Neg.	-	-	-

Abbreviations: ALT = alanine aminotransferase; ALP = alkaline phosphatase; AST = aspartate aminotransferase; ALP = alkaline phosphatase; BS = blood sugar; CPK = creatine phosphokinase; DBP = diastolic blood pressure; INR = international normalized ratio; LDH = lactate dehydrogenase; PR = pulse rate; PTT = partial thromboplastin time; RR = respiratory rate; SBP = systolic blood pressure; WBC = white blood cell.

history was insignificant. The patient's mucus and skin were hot and dry. The abdominal sounds were decreased. Arterial blood gas analysis revealed respiratory acidosis. Intravenous hydration was started for him. Midazolam was administered at the maximum allowable dose. He was in the intensive care unit for 2 days, and after another day of observation in the general ward, he was fully recovered and discharged.

2.6 | Case 6

A 50-year-old male with no known comorbidities presented with restlessness, dizziness, and drowsiness.

Intravenous hydration was administered. He was fully recovered and discharged home after 9 h of observation.

3 | DISCUSSION, AND REVIEW OF THE LITERATURE

Various compounds have anticholinergic effects, including prescription drugs, over-the-counter medications, illicit street drugs, and plants. Among these, plants that cause anticholinergic toxicity are less investigated.⁶

Poisonous plant exposures have increased in recent years and caused health concerns. There are case reports of

TABLE 2 Summary of reported cases of Datura poisoning from 2017 to 2021^a

NO.	Year, country Age (years), sex	Plant species		Amount symptom onset	Symptoms	Management	LOS Outcome
		Reason	Reason				
1–6	2020, Iran (current cases) 67, M	<ul style="list-style-type: none"> <i>Datura spp.</i> Unintentionally drank herbal tea that was prepared for refreshing effects. 	<ul style="list-style-type: none"> The whole family brewed about 4 tablespoons and each person consumed about a glass of decoction. 5 min 	Severe agitation, hallucination, tachycardia, hyperthermia, flushing, mucous and skin dryness, dilated pupils	Hydration, BZD	<ul style="list-style-type: none"> 2 days Fully recovered 	
32, F				Agitation, hallucination, nausea, tachycardia, hyperthermia, mucous and skin dryness, dilated pupils	Hydration, ondansetron, BZD	<ul style="list-style-type: none"> 1 day Fully recovered 	
38, F				Agitation, restlessness, nausea, tachycardia, mucous and skin dryness, dilated pupils	Oxygen, Hydration, BZD	<ul style="list-style-type: none"> 1.5 days Fully recovered 	
22, F				Severe agitation, hallucination, drowsiness, tachycardia	Hydration, BZD, haloperidol	<ul style="list-style-type: none"> 1.5 days Fully recovered 	
15, M				Severe agitation, dizziness, hallucination, tachycardia, hyperthermia, mucous and skin dryness, dilated pupils, decreased abdominal sounds, respiratory acidosis	Hydration, BZD	<ul style="list-style-type: none"> 3 days Fully recovered 	
50, M				Restlessness, dizziness, drowsiness, tachycardia	Observation	<ul style="list-style-type: none"> 9 h Fully recovered 	
7–13	2020, France ¹³ One adult and two children F, 41 M, 3 M, 11	<ul style="list-style-type: none"> <i>Datura stramonium</i> Eating a meal (spinach inadvertently mixed with <i>Datura</i>) 	<ul style="list-style-type: none"> NR 15 min 	Mild neurological signs (moderate agitation, headache, and mydriasis)	Observation	<ul style="list-style-type: none"> Rapid discharge No significant symptom 	
14	2020, Iran ¹⁴ 52, M	<ul style="list-style-type: none"> <i>Datura stramonium</i> Unintentional, mistook them for edible opium poppy seeds (<i>Papaver somniferum</i>) 	<ul style="list-style-type: none"> Ingested 1 teaspoon of seeds, vomited a substantial amount NR 	Severe restlessness, balance disturbances, hallucinations, mydriasis, tachycardia	Observation	<ul style="list-style-type: none"> Several hours Recovered 	
15	2020, Armenia ¹⁵ 5, F	<ul style="list-style-type: none"> <i>Datura wrightii</i>. Inadvertently ingested some kind of plant 	<ul style="list-style-type: none"> NR 3 h 	Agitation, headache, nausea, ataxia, visual hallucinations	Sedative (diazepam and haloperidol), rehydration, cardiac monitoring	<ul style="list-style-type: none"> NR Recovered 	
				Visual hallucination and irritability, ataxia, inappropriate behavior	Intramuscular prozerin, symptomatic treatment	<ul style="list-style-type: none"> 3 days Fully recovered 	

TABLE 2 (Continued)

NO.	Year, country	Age (years), sex	Plant species		Amount	Symptoms	Management	LOS
			Plant species	Reason				
16	2019, India ¹⁶	36, M	<i>Datura stramonium</i>	<ul style="list-style-type: none"> Intentional, eating <i>Datura</i> seeds for the past 1 year and alcohol for hallucinogenic and stimulating effects 	<ul style="list-style-type: none"> 50–70 seeds NR 	Drowsiness, slurred speech, hyperpyrexia, hypertension, tachycardia, pupillary dilatation, impaired concentration	Maintaining hydration, propranolol, paracetamol, diazepam	<ul style="list-style-type: none"> 1 week Relatively recovered with anisocoria, loss of eyesight, and cataract
17	2019, Italy ¹⁷	64, F	<i>Datura stramonium</i>	<ul style="list-style-type: none"> Unintentional, eating poisoned omelet prepared with wild herbs collected in the countryside 	<ul style="list-style-type: none"> NR NR 	Acute dysarthria, dysphagia, impaired consciousness	r-TPA because of stroke suspicious	<ul style="list-style-type: none"> 3 days Recovered
18	2019, Turkey ¹⁸	6, M	<i>Datura stramonium</i>	<ul style="list-style-type: none"> Accidental ingestion of unknown plant 	<ul style="list-style-type: none"> NR Within the hour 	Incoherent talks, visual hallucination, irrational behavior, dry mouth, bilateral dilated pupils, agitation, sinus tachycardia	Gastric decontamination (nasogastric lavage and activated charcoal) I.V fluid, midazolam, physostigmine	<ul style="list-style-type: none"> 2 days Fully recovered
19–35	2018, Hungary ¹⁹	18 patients	<i>Datura stramonium</i>	<ul style="list-style-type: none"> Food contamination 	<ul style="list-style-type: none"> NR 30 min 	11 patients: Pronounced hallucinations, agitation, tachycardia, mydriasis, and dry, warm skin Seven patients: dry mouth, dizziness, blurred vision	Sedatives, physostigmine, parenteral fluid, and supportive therapy Supportive therapy	<ul style="list-style-type: none"> 1 day Completely recovered
36–37	2018, Malaysia ²⁰	47, M	<i>Datura stramonium</i>	<ul style="list-style-type: none"> Unintentional 	<ul style="list-style-type: none"> Five to six well-cooked fruits NR 	Restlessness and abnormal behavior, flushing, dilated pupils, sinus tachycardia	Activated charcoal, midazolam	<ul style="list-style-type: none"> 24 h Completely recovered
41, F			<i>Datura stramonium</i>	<ul style="list-style-type: none"> Unintentional 	<ul style="list-style-type: none"> Minimal amount of well-cooked fruits NR 	Mild restlessness, flushing, dilated pupils, sinus tachycardia	Activated charcoal	<ul style="list-style-type: none"> Within a day Completely recovered
38	2018, Australia ²¹	14, M	<i>Datura innoxia</i>	<ul style="list-style-type: none"> Intentional, eaten the seeds of a plant found growing by the river 	<ul style="list-style-type: none"> NR NR 	Delirium, visual hallucinations, disinhibited behavior, tachycardia, dilated pupils, blurred vision	Observation	<ul style="list-style-type: none"> 24 h

(Continues)

TABLE 2 (Continued)

NO.	Year, country	Plant species		Amount	Symptoms	Management	LOS
		Reason	Amount symptom onset				
39–40	2018, Algeria ²²	5, M	<ul style="list-style-type: none"> <i>Datura stramonium</i> Unintentional, swallowing seeds from a plant that he picked near his home 	<ul style="list-style-type: none"> NR NR NR NR 	Agitation, impaired balance, tachycardia, bilateral mydriasis	Gastric lavage	<ul style="list-style-type: none"> 26 h Fully recovered
4, M					Restlessness, agitation, tachycardia, bilateral mydriasis, tachypnea, erythema in the chest and upper limbs	BZD	3 days
41–42	2017, Turkey ¹⁰	41, M	<ul style="list-style-type: none"> <i>Datura innoxia</i> Drunk a beverage containing <i>Datura</i> for asthma 	<ul style="list-style-type: none"> NR 2 h 	Excitation, delirium, impaired general condition, tachycardia, bilateral mydriasis	Gastric lavage, activated charcoal. Intravenous fluids and midazolam	<ul style="list-style-type: none"> 3 days Unresolved mydriasis (fully recovered after 7 days)
21, F			<ul style="list-style-type: none"> <i>Datura innoxia</i> Eaten contaminated food 	<ul style="list-style-type: none"> NR 2 h 	Vomiting, disorientation, hallucinations, impaired general condition, tachycardia, bilateral mydriasis	Gastric lavage, activated charcoal. Intravenous fluids and diazepam	<ul style="list-style-type: none"> 3 days Unresolved mydriasis (fully recovered after 5 days)
43–44	2017, Turkey ²³	64, M	<ul style="list-style-type: none"> <i>Datura stramonium</i> Unintentional, ingested a plant that found in his garden 	<ul style="list-style-type: none"> NR NR 	Agitation, exhaustion, nausea, dryness in the mouth, tachycardia, urinary retention	I.V fluid, proton pump inhibitor	<ul style="list-style-type: none"> 2 days Fully recovered
67, M			<ul style="list-style-type: none"> <i>Datura stramonium</i> Unintentional, used for relieving urinary symptoms 		Agitation, exhaustion, nausea, dryness in the mouth, tachycardia, urinary retention	I.V fluid, proton pump inhibitor	<ul style="list-style-type: none"> 1 day Fully recovered

Abbreviations: BZD = benzodiazepine, F = female, I.V = intravenous, LOS = length of hospital stay, M = male, NR = not reported.

^aCase reports published in French and English between 2017 and March 2021 are summarized.

intentional and unintentional poisonings following the use of jimsonweed and other related species. Toxic plants are better perceived by the rural residents, whereas urban inhabitants have had fewer opportunities to explore nature and identify plants. Thus, the risk of poisoning is generally higher among uninformed urban users.⁷ Kerchner and Farkas studied *Datura* poisoning cases from 2005 to 2017.⁸ We searched Embase and PubMed in English and French to find relevant cases that had been reported from 2017 to 2021. A total of 38 cases were identified. Table 2 summarizes their data, along with our six reported cases (shown in the first gray row). Among these total 44 cases, eight patients were female, 18 were male, and gender information of the other 18 cases was not available. A 3-year-old boy and a 67-year-old male were the youngest and oldest cases, respectively.

Common causes of toxicity include food confusion, accidental ingestion (usually by children), and overdoses when used as a traditional remedy. It is also used for recreational purposes for its hallucinogenic properties. Its low cost and easy access are the factors for an increase in consumption as a psychoactive substance. Lastly, in some countries in South East Asia and South America, *Datura* is used for criminal purposes, as chemical submission, to steal or abuse tourists. e reported a novel cause of toxicity.⁸

Regarding our cases, poisoning occurred following the preparation of aerial parts of the plant, including crushed and dried leaves and stems. This family had prepared a product obtained from an apothecary to have a refreshing drink. It is an example of unintentional poisoning that emphasizes careful monitoring of the sale of herbal products. While it is commonly believed that herbal products are safer than prescribed drugs, it is worrying that the specific effects and harmful interactions are not well understood. We recommend that all herbal products should be labeled with plant information and its effects. For this purpose, the supervision of the relevant legislative authorities is necessary.

Three members of this family have a history of psychiatric problems without proper treatment. Severe agitation of some members of this family may have been due to their underlying problem, as the severity of these symptoms did not match other signs. Physicians and the general public should be more aware of the dangers of using herbal products without the advice of a complementary medicine specialist.

The extent of toxicity varies depending on the season, stage of maturation and hydration, and the plant part. Although seeds and stems are the most toxic plant part of *Datura*, the leaves also have significant toxicity.⁹ The onset of poisoning symptoms was from 5 min to 3 h. This family drank herbal tea brewed from aerial parts of *Datura*, and poisoning symptoms appeared after about 5 min of consumption. Consumption of herbal products in decoction form may cause rapid release and absorption of alkaloids.

The most dominant symptoms of *Datura* poisoning are because of the anticholinergic effects and blockade of peripheral muscarinic receptors that innervate various organs. The anticholinergic toxicity could be peripheral, central, or both. The peripheral toxicity is less concerning. Mydriasis, dry skin and mucosa, tachycardia, and fever and flushing (because of vasodilation) are considered as the peripheral toxic manifestations. Central involvement, alone or in combination with peripheral signs, is considered more severe.¹⁰ Most of the reported cases presented both toxicities. Specific manifestations of CNS anticholinergic toxicity in these cases include anxiety, agitation, dysarthria, confusion, disorientation, visual hallucinations, bizarre behavior, impaired balance, and delirium. None of these patients experienced seizures or coma (Table 2).

There were no specific changes in laboratory values in most cases. Thus, proper history taking was the most crucial step for appropriate diagnosis. The botanical toxicology training of health care staff is often limited, so making a proper diagnosis and appropriate treatment can be complicated.

Most patients can be managed with supportive treatment and monitoring for a few days (Table 2). Cases of rhabdomyolysis, liver dysfunction, seizure, coma, and death are also reported.¹¹ Most of the cases described in the literature had a good prognosis after supportive treatment (Table 2). Our cases were managed with benzodiazepines and supportive care, and none of them received physostigmine. The administration of physostigmine, as an antidote is controversial and is limited to severe cases; its side effects including, cardiac, cholinergic effects, hypersensitivity, and seizures must be considered.¹²

4 | CONCLUSION

Many people consume herbal medicines and preparations for their presumed therapeutic or other health benefits. People often think that herbs are harmless, but consuming some of these herbs can be life-threatening. Here, we reported cases of family poisoning caused by the preparation of the herbal tea with refreshing effects. It is necessary to inform society about the rational use of herbal products. We recommend that all herbal products should be labeled with plant information and its presumed effects.

AUTHOR CONTRIBUTIONS

Study conception and design: Kheirollah Gholami, Niloofar Khoshnam-Rad. Patients' data collection: Marziyeh Heydari, Zahra Sahraei. Literature review: Niloofar Khoshnam-Rad. Analysis and interpretation of results: Niloofar Khoshnam-Rad, Mojgan Mashayekhi. Draft manuscript preparation: Niloofar Khoshnam-Rad, Marzieh Heydari, Kheirollah Gholami, Keyhan

Mohammadi. Revising the manuscript: Kheirollah Gholami, Keyhan Mohammadi, Nilofar Khoshnam-Rad. All authors reviewed the results and approved the final version of the manuscript.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.


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All data generated or analyzed during this study are available as part of the article, and no additional source data are required.

CONSENT

Written informed consent was obtained from the family for the publication of any potentially identifiable images or data contained in this article.

ORCID

Nilofar Khoshnam-Rad  <https://orcid.org/0000-0001-6700-3570>

Keyhan Mohammadi  <https://orcid.org/0000-0002-7699-8538>

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