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Atropa belladonna Poisoning in Children: A Case Report and Environmental Toxicology Perspective

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ABSTRACT

Atropa belladonna, commonly known as deadly nightshade, is a highly toxic plant found across Europe and other temperate regions. Its tropane alkaloids—atropine, scopolamine, and hyoscyamine—pose significant risks, particularly to children. Belladonna ranks among the most poisonous plants in Europe and other parts of the world. Children aged 1–5 are especially vulnerable due to their natural curiosity and tendency to explore their environment orally. The berries of Atropa belladonna resemble edible fruits such as blueberries or blackcurrants, making accidental ingestion a common route of poisoning. Diagnosis is primarily clinical, based on history and symptomatology. Laboratory confirmation is rarely available in acute settings. This article presents a case report of two pediatric patients who suffered acute poisoning after ingesting belladonna berries, highlighting the clinical presentation, treatment challenges, and broader environmental health implications. The case underscores the need for public awareness, toxic plant control, and improved access to antidotes in resource-limited settings.

Keywords: *Atropa belladonna, Pediatric poisoning, Environmental toxicology, Physostigmine*

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INTRODUCTION

Atropa belladonna, also known as belladonna or deadly nightshade, is a highly toxic plant from the Solanaceae family. Historically used for medicinal, cosmetic, and even spiritual purposes, it contains potent tropane alkaloids—atropine, scopolamine, and hyoscyamine—which pose serious health risks, particularly to children (Fernando *et al*., 2022; Klarity Health Library, 2023). These alkaloids are present in all parts of the plant, including the roots, leaves, stems, and berries.

Belladonna ranks among the most poisonous plants in Europe and other parts of the world (West Indian Medical Journal, 2021; Dijk *et al*., 2022). Children aged 1–5 are especially vulnerable due to their natural curiosity and tendency to explore their environment orally. The berries of *Atropa belladonna* resemble edible fruits such as blueberries or blackcurrants, making accidental ingestion a common route of poisoning (Jansson *et al*., 2022; Brief Lands, 2023). Even small amounts can lead to severe symptoms or death, with documented cases of fatal outcomes following ingestion of just a few berries (Pharmacology Mentor, 2023; Russo *et al*., 2023).

The alkaloids in belladonna act as competitive antagonists at muscarinic acetylcholine receptors, leading to anticholinergic toxidrome. This syndrome disrupts parasympathetic nervous system functions, resulting in symptoms such as dry mouth, flushed skin, hyperthermia, tachycardia, urinary retention, hallucinations, and delirium (Lamireau *et al*., 2002; Reed *et al*., 2023). Neurological manifestations may include confusion, agitation, and seizures, particularly in pediatric patients (Ahmed *et al*., 2022; Asiwe *et al*., 2022; Babalghith, 2022; Dijk *et al*., 2022; Evans *et al*., 2022; Fernando *et al*., 2022; Ismailov *et al*., 2022; Jansson *et al*., 2022; Nasr *et al*., 2022; Pratama *et al*., 2022; Sefah *et al*., 2022; Wei & Zhao, 2022; Ganea *et al*., 2023; Meneses-La-Riva *et al*., 2023; Muresan *et al*., 2023; Reed *et al*., 2023; Russo *et al*., 2023; Tsiganock *et al*., 2023; Todayama *et al*., 2024).

Diagnosis is primarily clinical, based on history and symptomatology (Alqahtani *et al*., 2022; Iryna *et al*., 2022; Landry & Farkas, 2022; Pruthi *et al*., 2022; Yao & Cai, 2022; Domatskiy & Sivkova, 2023; Albalawi, 2024). Laboratory confirmation is rarely available in acute settings. In severe cases, physostigmine, a reversible cholinesterase inhibitor, can be used as an antidote to reverse central and peripheral anticholinergic effects (Krasniqi *et al*., 2019; Tsiganock *et al*., 2023). However, its use requires careful monitoring due to potential adverse effects such as bradycardia and seizures (Burns *et al*., 2000).

Public health awareness and early recognition are essential to prevent serious outcomes. Education about toxic plants, especially in rural and underserved areas, remains a critical preventive strategy (Spiller *et al*., 2013). Plant poisoning accounts for a notable proportion of pediatric toxic exposures worldwide. In a European multicenter study, plant-related intoxications represented up to 5% of pediatric poisoning cases, with *Atropa belladonna* among the most frequently implicated

species (Lamireau *et al*., 2002). In developing regions, the lack of poison control infrastructure and limited access to antidotes exacerbate the risk of poor outcomes.

In Kosovo and other parts of the Balkans, traditional remedies involving herbal preparations are still used in rural communities. This cultural practice increases the risk of intentional but misguided administration of toxic plants to children, often without medical supervision (Krasniqi *et al*., 2019).

MATERIALS AND METHODS

This study focused on accidental plant poisoning in pediatric patients. Clinical data were collected from a case involving two children admitted to a pediatric cardiology unit.

Case report

We report the case of two female children, aged 7 and 4 years, who were admitted to the pediatric cardiology unit with tachycardia and altered mental status. The lab tests were performed, and the results were within normal values. Upon further examination and parental interviews, it was revealed that the children had ingested *Atropa belladonna* berries, mistaking them for blueberries.

The younger patient exhibited mild symptoms that resolved spontaneously. The older patient presented with more severe clinical signs, including: mydriasis (dilated pupils), flushed, dry skin, agitation and hallucinations, tachycardia, ataxia, and delirium.

Due to the absence of a poison control center and limited access to antidotes, regional authorities were contacted for a supply of physostigmine, a reversible cholinesterase inhibitor. With the help of family members, an ampoule of physostigmine was located and administered to the older patient. Following a single dose, the condition improved significantly, and the symptoms subsided. Both patients were discharged after three days of hospitalization.

RESULTS AND DISCUSSION

Anticholinergic toxidrome caused by belladonna poisoning can mimic other conditions such as encephalitis, drug overdose, or psychiatric disorders (Burns *et al*., 2000). Prompt recognition is critical, especially in settings where toxicological screening is unavailable. The use of physostigmine remains controversial due to its narrow therapeutic window and potential for bradycardia or seizures, but it is considered effective in reversing central symptoms when administered under close monitoring (Spiller *et al*., 2013).

Atropa belladonna poisoning presents a unique challenge in pediatric toxicology due to its rapid onset, diverse symptomatology, and potential for misdiagnosis. The anticholinergic toxidrome, characterized by mydriasis, dry mucous membranes, flushed skin, tachycardia, hallucinations, and delirium, can mimic a range of conditions, including viral encephalitis, psychiatric disorders, and drug intoxication (Ahmed *et al*., 2022; Lamireau *et al*., 2002; Brief Lands, 2023). In children, these symptoms may be misattributed to behavioral or neurological issues, delaying appropriate intervention (Dipalma *et al*., 2022; Zhao *et al*., 2022; Shaheen *et al*., 2023; Wei *et al*., 2023; Yurievna *et al*., 2023).

The case described illustrates the diagnostic complexity and therapeutic limitations in resource-constrained settings (Al-Mubarak *et al*., 2024; Makakova *et al*., 2024; Varoneckaitė *et al*., 2024). The absence of a poison control center and the limited availability of antidotes such as physostigmine significantly hindered timely treatment. Although physostigmine is considered the antidote of choice for severe anticholinergic poisoning, its use remains controversial due to risks of bradycardia, seizures, and cholinergic crisis if not administered under strict monitoring (Burns *et al*., 2000; Krasniqi *et al*., 2019; Pratama *et al*., 2022). Nevertheless, in this case, a single dose led to rapid clinical improvement, underscoring its efficacy when used judiciously.

From an environmental health perspective, the widespread presence of *Atropa belladonna* in temperate regions and its visual similarity to edible berries pose a persistent risk to children. Accidental ingestion is often facilitated by unsupervised outdoor play, lack of botanical awareness, and seasonal berry growth (West Indian Medical Journal, 2021; Wei & Zhao, 2022; Brief Lands, 2023). In rural areas, traditional medicine practices may further increase exposure risk, as belladonna is sometimes used in folk remedies without understanding its toxic potential (Krasniqi *et al*., 2019; Nasr *et al*., 2022; Meneses-La-Riva *et al*., 2023).

Public health interventions must address these environmental and cultural factors. Educational campaigns targeting parents, schools, and community health workers can improve plant recognition and promote safe practices. Removal of toxic plants from public spaces, especially near schools and playgrounds, should be prioritized. Additionally, labeling and regulation of herbal products containing belladonna derivatives are essential to prevent therapeutic misuse.

Clinicians should maintain a high index of suspicion when evaluating children with unexplained neurological or cardiovascular symptoms, especially in regions where toxic plants are endemic. Training in plant identification and toxidrome recognition should be integrated into pediatric and emergency medicine curricula. Furthermore, establishing regional poison control networks and improving access to antidotes like physostigmine can significantly enhance clinical outcomes.

This case also highlights the importance of intersectoral collaboration. The successful acquisition of physostigmine through family networks reflects the potential of community engagement in overcoming systemic limitations. However, reliance on informal channels is not sustainable and underscores the need for formalized emergency response systems.

In conclusion, *Atropa belladonna* poisoning in children is a preventable yet potentially fatal condition. Addressing it requires a multifaceted approach that combines clinical vigilance, environmental management, public education, and policy reform. Future research should focus on mapping toxic plant distribution, evaluating the effectiveness of educational interventions, and developing safer therapeutic alternatives to physostigmine.

1. In addition to clinical management, public health strategies should include:
2. Educational campaigns for parents and caregivers
3. Clear labeling and regulation of herbal products

4. Removal of toxic plants from areas accessible to children
5. Establishment of regional poison control centers
6. Training of healthcare professionals in toxic plant identification and management

CONCLUSION

Acute plant poisoning in children, particularly from *Atropa belladonna*, remains a serious and potentially life-threatening condition. The clinical presentation can be dramatic, with rapid onset of anticholinergic symptoms that may mimic neurological or psychiatric disorders, complicate diagnosis, and delay appropriate treatment (Lamireau *et al*., 2002; Brief Lands, 2023). In regions lacking toxicology infrastructure or access to antidotes like physostigmine, timely recognition and symptomatic management become even more critical (Burns *et al*., 2000; Krasniqi *et al*., 2019).

This case highlights the importance of public awareness regarding toxic plants, especially those that resemble edible fruits. Parents, caregivers, and educators must be informed about the dangers posed by common garden and wild plants (West Indian Medical Journal, 2021; Pharmacology Mentor, 2023). Preventive strategies should include community education, removal of high-risk plants from areas frequented by children, and clear labeling of herbal products (Spiller *et al*., 2013).

From a healthcare perspective, clinicians should maintain a high index of suspicion when evaluating children with unexplained neurological or cardiovascular symptoms. Strengthening regional poison control networks, improving access to antidotes, and training medical personnel in toxic plant identification and management are essential steps toward reducing morbidity and mortality (Burns *et al*., 2000; Lamireau *et al*., 2002).

Ultimately, the intersection of clinical vigilance, public education, and policy-level support is key to preventing and effectively managing pediatric plant poisonings. The lessons from this case serve as a reminder that even ancient plants with medicinal histories can pose modern dangers when misused or misunderstood (Krasniqi *et al*., 2019; Klarity Health Library, 2023).

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