Case Report

Indian Journal of Emergency Medicine
Volume 10 Number 4, October - December 2024
DOI: http://dx.doi.org/10.21088/ijem.2395.311X.10424.11

Inadvertent Isopropyl Alcohol Toxicity in Geriatrics: Explorating Diagnostic Dilemmas in Hand Sanitizer Exposure

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How to cite this article:

Vijay Kumar S S, Shabbir Shekhli, Anila Jose, Ananth Prasad Rao HT, Inadvertent Isopropyl Alcohol Toxicity In Geriatrics: Explorating Diagnostic Dilemmas in Hand Sanitizer Exposure. Ind J Emerg Med. 2024;10(4):252-256.

Abstract

Since the onset of the COVID-19 pandemic, the widespread use of alcohol-based hand sanitizers for hygiene management has significantly increased their presence in households. This case report details a rare instance of acute isopropyl alcohol poisoning (AIpAP) in a 78-year-old female, who accidentally ingested hand sanitizer, mistaking it for a beverage. The patient presented with severe symptoms, including unresponsiveness and vomiting, requiring immediate medical attention. Despite the gravity of her condition, conservative treatment led to a full recovery. This case emphasizes the urgent need for public education on the safe storage and labeling of hand sanitizers to prevent accidental ingestion and highlights the importance of considering AIpAP in the differential diagnosis of unexplained consciousness disorders.

Keywords: Propyl alcohol toxicity, Altered mental status, Hand sanitizer poisoning.

INTRODUCTION

Acute isopropyl alcohol poisoning (AIpAP) is a significant medical concern, particularly in vulnerable populations such as the elderly. AIpAP usually manifest as admission ingestion, behavior change, slurring of speech, in coordination of movements and nystagmus.[1]

This case report highlights an unusual but increasingly pertinent instance of AIpAP resulting from the accidental ingestion of hand sanitizer. Since the COVID-19 pandemic, the use of hand sanitizers, commonly alcohol based, for hygiene management has become widespread, increasing the availability and presence of these products in households.[2] The elderly patient inadvertently consumed the hand sanitizer, mistaking it for a packed beverage. Given the high ethanol concentration in hand sanitizers, this mistake led to severe intoxication, necessitating urgent medical intervention.[3]

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Received on: 14-08-2024

Accepted on: 05-10-2024

The case offers insights into the clinical presentation, management, and outcomes of ethanol poisoning in older adults, contributing valuable information to the body of knowledge on toxicology and geriatric care. Through this report, we aim to inform healthcare professionals about the risks and reinforce the necessity for preventive measures to protect at-risk populations from accidental poisoning.

CASE REPORT

A 78-year-old female presented to our emergency department (ED) following an episode of unresponsiveness and vomiting, which had occurred three hours prior while she was in her room. Upon arrival at the ED, the patient was found to be unresponsive with a Glasgow Coma Scale (GCS) score of E3V3M4. She exhibited partial airway obstruction, as evidenced by snoring and gargling sounds. An oropharyngeal airway was promptly inserted, and suction was performed. The patient's respiratory rate was 16 breaths per minute, and her oxygen saturation (SpO2) was 85% on room air. Oxygen therapy was initiated via a reservoir mask at 10 liters per minute, resulting in an improvement of SpO2 to 93%.

The patient's extremities were cold, with a feeble pulse, and capillary refill time was prolonged (>3 seconds). Her heart rate was 134 beats per minute, and blood pressure was not initially recordable. After administration of a 1-liter intravenous bolus of normal saline, her blood pressure improved to 80/50 mmHg. Pupillary examination revealed round, equal pupils measuring 3 mm, with a sluggish response to light bilaterally. The patient's blood glucose level was found to be low at 47 mg/dL, necessitating the infusion of 50 grams of intravenous dextrose. Arterial blood gas analysis showed mild metabolic acidosis (pH 7.34, PCO2 36.2 mmHg, bicarbonate 21.2 mEq/L), and electrocardiography revealed sinus tachycardia.

During the secondary survey, it was discovered that the patient had accidentally ingested approximately 25 mL of a hand sanitizer containing 75% propyl alcohol (45% w/w isopropyl alcohol and 30% w/w n-propyl alcohol), mistaking it for a similarly colored beverage. (Fig. 1) The patient informed her caretakers of the ingestion, but they did not seek immediate medical attention. The patient subsequently became progressively drowsy and experienced three episodes of vomiting before being brought to the ED. Patient had no co-morbidities and was not on any medications. Patient also didn't have any addictive habits like alcohol intake and smoking.

Fig. 1: 75% Propyl Alcohol hand santizer

A provisional diagnosis of acute propyl alcohol intoxication was made. Computed tomography (CT) of the brain was performed to exclude other potential causes of unconsciousness, but the results were unremarkable. Urinalysis was strongly positive for ketone bodies. Other blood investigations were normal. (Table 1)

Table 1: Investigations on Ed Presentation

Investigation	Results	Bio Ref. Interval
Arterial Blood Gas		
pH	7.34	7.35-7.45
pCO2	36.2	35-45 mmHg
Bicarbonate	21.2	22-26 mEq/L
pO2	75.2	80-108 mmHg
Lactate	2.4	mmol/L
SaO2	88	%
Plasma Ethanol Level		
Ethanol level	Not Detected	mg/dL
Complete Hemogram		
Haemoglobin	11.30	14.50 - 15.50 gm%
Total count	12560.00	4,000.00 11,000.00 cells/cumm
Neutrophils	76.10	40.00 - 75.00%
Lymphocytes	10.70	20.00 - 45.00%

Investigation	Results	Bio Ref. Interval
Monocytes	10.00	2,00 - 10.00%
Eosinophils	0.00	1.00 - 6,00%
Basophils	0.20	0,00 - 1.00%
Platelet count	1.85	1.50 - 4.50 lakh/cumm
MPV	10.30	7.20 - 11.70
Rbc count	6.87	million/cu
MCV	88.30	80.00 – 100.00 fL
MCH	27.40	26.00 - 34.00 pg
MCHC	38.10	31.00 - 35.00%
RDW-CV	13.80	11.50 – 14.00%
Packed cell volume	43.2	40.7–50.3%
RFT Renal Function Test		
Urea	36.45	12.00 - 40.00 mg/dL
Uric acid	5.90	3,50 - 8.50 mg/dL
Serum creatinine	1.5	Male: 0.66-1.25 mg/Dl Female: 0.52-1.04 mg/dL
Blood Urea Nitrogen	17.01	6-24 mg/dL
Sodium	132.00	136.00 - 145.00 mEq/L
Potassium	4.33	3,50- 5.10 mEq/L
Chloride	113.00	98.00 -111.00mEq/L
Liver Function Test		
Total proteins	5.50	6.00 – 8.30 gm/dL
Albumin	3.80	3.50-5.20 gm/dL
Globulin	1.70	2.80-3.00 gm/dL
Bilirubin total	1.7	0.2- 1,3 mg/dL
Bilirubin direct	0.7	0.0 - 0.3 mg/dl
AST(SGOT)	56.0	<35 U/L
ALT(SGPT)	43.0	<45 U/L
Alkaline phosphatase	64.0	Adults :38-126 U/L

A urine toxicology screening panel for common toxins was conducted, but all results came back negative, as shown in Table 11.2. Blood ethanol levels were also negative. The institute, along with nearby private labs, did not have the capability to measure isolated isopropyl alcohol levels. Serum osmolarity was measured at 348 mOsm/kg, while the calculated osmolarity was 273.08 mOsm/kg, leading to an osmolar gap of 74.92 mOsm/L, which is notably elevated. The calculated osmolarity was determined using the below formula.

Calculated osmolarity = 2×Na + 1.15×GLU/18 + BUN×2.8.

Table 2: Urine For Qualitative Toxicological Screening

Drug	Result	Cut off Value (ng/ml)
Amphetamine	Negative	300
Marijuana	Negative	50
Barbiturates	Negative	300
Morphine	Negative	300
Benzodianzepines	Negative	300
Phencyclidine	Negative	25
Opiates	Negative	2000
Tricyclic Antidepressants	Negative	1000
Methadone	Negative	300
Methamphetamine	Negative	1000
Methylenedioxymethamphetamin	Negative	500

Given the elevated osmolar gap, the presence of ketosis without significant acidosis, and the circumstantial finding of an empty hand sanitizer bottle near the patient, a clinical diagnosis of isopropyl alcohol intoxication was established.

The patient was admitted to the critical care unit, where she received an additional 500 mL of intravenous normal saline, followed by maintenance fluids at 100 mL/hour. Oxygen therapy was continued. Two hours after arrival, her vitals had stabilized, with a heart rate of 102 beats per minute, blood pressure of 112/68 mmHg, but no improvement in GCS (E3V3M4).

Over the next 12 hours, the patient's condition gradually improved, with her GCS increasing to E3V4M6. By the third day of admission, her consciousness had fully returned (GCS E4V5M6), and she was transferred to the general ward. Despite thorough questioning, the patient was unable to recall ingesting the hand sanitizer.

The patient was discharged on the fifth day after receiving education on the risks of ingesting non-consumable substances. She was closely monitored post-discharge and remained stable and asymptomatic at her two-week follow-up, with no further incidents of alcohol ingestion reported.

DISCUSSION

The COVID-19 pandemic has brought heightened attention to the importance of hand hygiene, leading to a significant increase in the use of hand sanitizers. While these alcohol-based disinfectants have been effective in reducing the spread of the virus, there has also been a notable rise in adverse events associated with their use.[4] A concerning trend has emerged, particularly involving accidental ingestion of hand sanitizers, with the majority of incidents occurring among children. A study by Khadse *et al*. analyzed media reports from India in 2021 and identified over 57 cases related to disinfectant-induced accidents, underscoring the growing public health issue.[5]

Isopropyl alcohol (IPA), a common component in many hand sanitizers, poses significant risks when ingested or absorbed through the skin. Acute toxicity in humans occurs at an oral LD50 of greater than 2000 mg/kg. Similarly, dermal exposure can lead to acute toxicity at an LD50 exceeding 2000 mg/kg.[6] Despite these toxicity thresholds, accidental ingestions, particularly in vulnerable populations such as children and the elderly, can lead to severe health consequences.

In our case we encountered, a geriatric female accidentally ingested a hand sanitizer, mistaking it for a beverage due to the similar appearance of the bottle. This incident highlights a critical need for public education on the proper storage and labeling of disinfectants. It is imperative that these products are not stored in containers resembling drink bottles, are clearly labeled, and are not kept in places such as refrigerators where they could be mistaken for consumables.

Alcohol-based hand sanitizers commonly used in our country contain approximately 80% ethanol or 75% propyl alcohol.[7] Both of these substances are toxic when ingested and can lead to serious clinical manifestations, including coma, respiratory depression, hypotension, and in severe cases, death.[3] Although isopropyl alcohol poisoning is often encountered in clinical practice, cases arising from non-beverage sources like hand sanitizers are relatively rare. However, the increase in sanitizer use due to the pandemic has made such cases more common, raising concerns about the safety of these products. Metabolic acidosis does not occur in cases of isopropanol ingestion because it's active metabolite, acetone, is a terminal ketone and remains uncharged, unlike the active metabolites produced in other toxic alcohol ingestions. However, early in the clinical presentation, an elevated osmolar gap may be observed before significant metabolism has occurred. Studies indicate that a 1 mg/dL increase in serum isopropanol can result in a 0.17 mOsm/kg rise in serum osmolality.[7]

The treatment of acute alcohol poisoning primarily involves supportive care. In severe cases, intubation and mechanical ventilation may be necessary to manage respiratory depression and ensure airway protection. Although activated charcoal is effective in some types of poisoning, it is not recommended for treating ethanol or isopropyl alcohol ingestion due to its ineffectiveness in binding alcohol molecules.[8] Hemodialysis can be considered in cases of severe alcohol poisoning, especially when there is a risk of life-threatening complications.[9] However, the decision to proceed with hemodialysis should be made on a case-by-case basis, taking into account the patient's overall condition, metabolic status, and the potential risks associated with the procedure.[10]

In the case described, despite the severity of symptoms and the initial concern for significant alcohol intoxication, the patient's condition stabilized with fluid resuscitation alone. Over time, her consciousness level improved, leading to a full recovery without the need for invasive interventions. This outcome suggests that, in some cases, conservative management with close monitoring may be sufficient, especially in patients who do not exhibit life-threatening symptoms.[11]

CONCLUSION

The case underscores the importance of considering acute alcohol poisoning in the differential diagnosis of unexplained consciousness disorders, particularly when alcohol-based hand sanitizers are present in the patient's environment. With the increasing use of these products, there is a pressing need for public education on their safe use and storage to prevent accidental ingestion. Healthcare providers should remain vigilant for signs of alcohol poisoning and be prepared to initiate appropriate supportive care. Further research and public health initiatives are essential to address the rising incidence of sanitizer-related poisoning and to mitigate the risks associated with these widely used products.

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