**Lindane and Cetrimide lotion poisoning in an adult patient: A case report on an uncommon ingestion**

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1. Introduction

Gamma benzene hexachloride, commonly referred to as Lindane, emerged in the 1950s as an organochloride pesticide initially intended for topical use as a scabicide among humans.(1) Its affordability and effectiveness led to its rapid adoption as a primary treatment for scabies and head lice.(2) However, concerns about its neurotoxic effects arose after prolonged and widespread usage.(1-2) The severity of lindane poisoning symptoms is contingent on the absorbed dose, with reported oral lethal dose (LD50) in rats being 60 mg/kg body weight and no clear evident lethal dose for humans.(3) Acute oral poisoning may lead to developing primary signs including vomiting and manifestations of central nervous system stimulation, such as convulsions and hyperexcitability. (4) Seizures typically commence within 1-2 hours and may persist for several days, accompanied by side effects such as skin irritation, dizziness, muscular cramps, and rarely, aplastic anemia and megaloblastic anemia.(4-5) Lindane, despite its potential life-threatening side effects, exhibited the slowest pediculicidal and least effective ovoidal activity among Food and Drug Administration (FDA)-approved pediculicides, prompting its reclassification to a second-line therapy for pediculosis in 1995 in favour of safer alternatives.(6)

Similarly, Cetrimide, a quaternary ammonium compound, commonly found in sterilizing and detergent fluids for skin antisepsis, hair shampooing, and instrument cleaning in hospitals and communities,poses risks when ingested, causing nausea, vomiting, and potential oesophageal damage and necrosis with strong solutions.(7) Cetrimide poisoning typically manifests with mild symptoms, including nausea, vomiting, sore throat, and abdominal pain, while aspiration of Cetrimide mixed with 'Dettol' liquid can lead to acute respiratory distress syndrome (ARDS).(8) With no specific antidote identified (9), the treatment for both Lindane and Cetrimide poisoning primarily involves symptomatic and supportive management in the Intensive Care Unit (ICU).

1. Case History and examination

An 18-year-old female arrived at the Emergency Department (ED) of a local hospital shivering and with decreased level of consciousness, approximately 30 minutes after reportedly ingesting Lindane and Cetrimide lotion at home. The lotion was obtained from a nearby pharmacy for lice treatment.

On presentation, she had a Glassgow Coma Scale (GCS) of 10/14 (E2M4V3), a pulse rate of 110/min, blood pressure of 100/60 mmHg, respiratory rate of 24/min, temperature of 98°F, and oxygen saturation (spO2) of 94% in room air. Physical exams along with respiratory, cardiovascular, abdominal, musculoskeletal, skin, and oral examinations showed no abnormalities. The Central Nervous System examination showed no focal neurological deficits or signs of meningeal irritation and had intact sensory and motor functions and reflexes.

Upon arrival at a new hospital with ICU services, the patient disclosed a history of ingesting 70-100ml of poison with suicidal intent following a dispute with her boyfriend. She reported mild epigastric pain but no headache, fever, blurred vision, loss of consciousness, abnormal body movements, bleeding, or dizziness. She also had experienced one episode of vomiting at the ED. The patient had no significant past medical, surgical, menstrual, or family history and was a non-alcoholic and non-smoker. Vitals and examination findings were normal, leading to the patient's admission to the ICU for observation.

1. Methods

In the local hospital, a nasogastric (NG) tube was inserted, and gastric lavage was performed with 1.5 liters of 0.9% Normal Saline, resulting in an improvement in GCS to 15/15 after 10 minutes. The patient was subsequently referred to a higher center for Intensive Care services.

Laboratory investigations done at the hospital with ICU services, consisting of Complete Blood Count, Renal Function Test, Liver Function Test, Chest X-ray, PT/INR, ECG, and serology, returned normal results. However, a urine Routine and Microscopic Examination revealed a Urinary Tract Infection (UTI) with 20-25/hpf pus cells and +++ bacteria. The patient was kept NPO for 24 hours and received symptomatic treatment, including Injection Pantoprazole and Ondansetron. Additionally, she was administered Syrup Sucralfate 15ml every 6 hours via Nasogastric tube and prescribed Tablet Cefixime 200mg every 12 hours for the UTI.

The psychiatric evaluation uncovered a history of multiple self-harm and suicide attempts, increased emotional instability, crying spells, anxious overthinking, and irritability. The patient was prescribed Tablet Fluoxetine 10mg once daily and Tablet Clonazepam 0.25mg every 12 hours for 3 days, followed by once nightly for 5 days, indicating a possible diagnosis of bipolar disorder with Anxiety symptoms.

1. Conclusion and Results

After 72 hours of normal examinations and laboratory findings, patient was discharged with medications (tablets Cefixime 200mg for 4 more days, Pantoprazole 40mg, Fluoxetine 10mg and Clonazepam 0.25 mg) and advised to follow up with her treating physician and psychiatrist after 3 weeks.

Though poisoning from Lindane and Cetrimide is an infrequently reported occurrence, proactive preparedness of the case management is required from a life-saving perspective. Lindane, on its own, is associated with intentional side effects such as nausea, vomiting, dizziness, muscle cramps, anemia, hyperglycemia, pulmonary edema, seizures, and even fatality. Additionally, Cetrimide exhibits side effects like nausea, vomiting, esophageal damage, necrosis, and abdominal pain. Notably, there exists no antidote for either of these toxins.

Our patient ingested approximately 70-100 ml of Lindane and Cetrimide, experiencing shivering and a decreased level of consciousness within minutes, followed by vomiting and abdominal pain within an hour. Through prompt gastric lavage and comprehensive supportive and symptomatic treatment, the patient remained free of physical symptoms for 72 hours, leading to her eventual discharge. No deviations were observed in examination and laboratory findings.

Given the absence of specific antidotes for these substances, we recommend immediate gastric lavage within two hours of ingestion and rigorous symptomatic and supportive care in the Intensive Care Unit (ICU) for a minimum of 72 hours. This proactive approach aims to mitigate the potential deliberate side effects that may manifest in the future.

1. Discussion

Lindane, identified as the γ isomer of benzene hexachloride, is recognized for its insecticidal attributes. While banned in agricultural applications, it persists for therapeutic use in scabicidal lotions and shampoos. Lindane is employed as a secondary measure, subject to restrictions in certain regions such as California (10) and was banned for formulation and use in 2022 in Nepal (11). It, along with cyclodienes, operates by binding to the picrotoxin site on the chloride channel, impeding its opening and antagonizing the inhibitory effects of gamma-aminobutyric acid (GABA) (12). Lindane ingestion typically leads to vomiting, central nervous system stimulation, and seizures within 1-2 hours (4), but these symptoms were not evident in our case.

In most instances, ingestion of Savlon, an antiseptic liquid, results in relatively mild symptoms like nausea and vomiting (8). E.S. Mucklow documented cases of accidental ingestion of a dilute antiseptic solution by infants, causing caustic burns (13). Symptoms included throat pain, minor hematemesis, and abdominal pain, with one severe case marked by acute pulmonary edema. However, in our case, despite ingesting Savlon, the case experienced only vomiting and loss of consciousness, possibly due to prompt nasogastric lavage within an hour of ingestion.

Nordt and Chew's study reported three toddlers orally ingesting lindane, resulting in nausea and central nervous system toxicity. Fortunately, all children fully recovered without complications (14). The rapid CNS recovery, despite a substantial total body burden, was attributed to lindane redistribution to the bloodstream and adipose tissue. Prompt vomiting and nasogastric lavage likely prevented convulsive episodes, presenting a contrast to the findings in a different study. In our case, immediate lavage after loss of consciousness averted further CNS complications.

Similar to Thomas Y.K. Chan's study on Savlon poisoning, our patient experienced self-limiting nausea and vomiting within 24 hours (8). However, the absence of hematemesis, abdominal pain, and pulmonary symptoms distinguishes our case from some in Chan's study (8).

In managing lindane toxicity, seizure control takes precedence due to its impact on GABA. Benzodiazepines like diazepam or lorazepam, acting as GABA agonists, are effective in promptly managing seizures. The lack of additional complications aligns with existing studies (15), highlighting supportive treatment and vigilant monitoring for convulsive episodes and respiratory distress associated with Lindane and Cetrimide exposure.

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16. Informed written consent

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I, **Ranjana Pariyar**, hereby grant my voluntary and informed consent for the preparation and publication of a case report detailing my medical condition and treatment involving Lindane and cetrimide poisoning. I understand that the purpose of this case report is to contribute to medical literature, sharing valuable insights and information that may benefit healthcare professionals and researchers.

**Details of the Case Report:** The case report will include information about my medical history, clinical presentation, diagnostic evaluations, treatment provided, and outcomes related to the lindane and cetrimide poisoning.

**Confidentiality:** I acknowledge that my identity will be kept confidential, and efforts will be made to ensure that my personal information is not disclosed. Any details that could

potentially reveal my identity will be appropriately masked or omitted.

**Right to Withdraw Consent:** I understand that participation in this case report is entirely voluntary. I have the right to withdraw my consent at any time without any impact on my current or future medical care.

**Publication and Distribution:** I authorize the publication of this case report in medical

journals, conferences, or other educational platforms. I understand that the case report may be accessible to the general public through these channels.

**Contact Information:** For any queries or concerns related to this case report, I may contact the principal investigator or the healthcare professional overseeing my care at pragyarainov07@gmail.com

I have been provided with an opportunity to ask questions and have received satisfactory answers regarding the case report. I understand the nature and purpose of the case report and agree to the terms outlined in this informed consent.

**Patient's Full Name: RANJANA PARIYAR**

**Patient's Signature: Date:**  2024-01-10

Authors Contribution:

* 1. Dr Pragya Rai
     + First/Lead author
     + corresponding author
     + conceptualization
     + framing of the case report
     + implementation of the research plan
     + writing the case history
     + project administration
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  2. Dr Shrijan Shrestha
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     + Implementation of research
     + Writing discussion of the report
     + Data curation
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