Postgraduate Journal of Pediatrics and Adolescent Medicine
Volume 3, Issue 1 - 2026 , Pg. No. 13-16
Peer Reviewed & Open Access Journal

Case Report

Accidental Naphthalene Mothball Ingestion Leading to Methemoglobinemia and Severe Intravascular Haemolysis in a 3-Year-Old Girl: A Case Report

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How to cite this article:
Hatkar N K, Bhor M S. Accidental Naphthalene Mothball Ingestion Leading to Methemoglobinemia and Severe Intravascular Haemolysis in a 3-Year-Old Girl: A Case Report. Postgrad J Pediatr Adol Med. 2026;3(1): 13-16.

Date of Submission: 2026-05-10
Date of Acceptance: 2026-06-08

A B S T R A C T

Ingestion of naphthalene-containing mothballs is a well-recognised cause of acquired methaemoglobinemia and haemolytic anaemia in young children, particularly in developing countries. We report a 3-year-old girl who developed profound cyanosis, severe anaemia and haemoglobinuria after unintentional ingestion of mothballs. Admission haemoglobin was critically low, requiring two packed red-cell transfusions, while serial laboratory results confirmed ongoing intravascular haemolysis with elevated indirect bilirubin, reticulocytosis and markedly reduced haptoglobin. Methemoglobinemia was documented during the hospital course, with a measured methaemoglobin level of 8.8%. Intravenous methylene blue (1.5 mg/kg), blood products and supportive care resulted in a complete recovery. This case emphasises distinctive laboratory patterns and the importance of early suspicions of common household toxins among paediatric patients.

Keywords: Naphthalene poisoning, Methemoglobinemia, Haemolytic anaemia, Methylene blue, Child, Case report

Introduction

Unintentional ingestion of mothballs containing naphthalene can trigger severe oxidative damage, leading to methaemoglobinemia and intravascular haemolysis. [1] Young children are especially susceptible because of exploratory behaviour and relatively higher toxin exposure per body weight.[2] Although naphthalene toxicity is frequently associated with glucose-6-phosphate dehydrogenase deficiency, it can also occur in individuals with normal enzyme levels.[3]

Written informed consent for publication of this case report and accompanying clinical details was obtained from the patient's parent. A copy of the written consent is available for review by the editor-in-chief upon reasonable request.

Case Presentation

A 3-year-old girl from the Pawara community, born to non-consanguineous parents, was reported to have swallowed naphthalene mothballs at approximately 4:00 PM on 15 December 2025. She experienced two to three episodes of vomiting that evening and was given ondansetron at a local facility followed by drowsiness. Because of persisting drowsiness, she was referred and admitted to our unit on 17 December 2025 at 3:00 PM.

On arrival she was conscious and afebrile but showed severe pallor and central cyanosis. Heart rate was 152 beats per minute, respiratory rate was 36 breaths per minute, and oxygen saturation was 48% on supplemental oxygen. There was no history of fever or seizures. Systemic examination was normal apart from an anemia-related flow murmur.

CARE Clinical Timeline

15 Dec 2025 4 PM – Accidental ingestion of mothballs

15 Dec 2025 evening – Vomiting; treated locally

16 Dec 2025 – Persistent drowsiness

17 Dec 2025 – Admission; Hb 4.2 g/dL; first packed-cell transfusion

18 Dec 2025 – Haemoglobinuria; FFP administered

19 Dec 2025 – Methemoglobin 8.8%; methylene blue administered

20 Dec 2025 – Hb 5.1 g/dL; second packed-cell transfusion

21 Dec 2025 – Clinical recovery and discharge

Laboratory Investigations

Serial haematological and biochemical tests revealed severe haemolytic anaemia accompanied by indirect hyperbilirubinaemia and reticulocytosis and confirmed methaemoglobinemia, as shown in Figure 1. Methaemoglobin estimation (Figure 2) was performed on EDTA-anticoagulated whole blood using UV-visible spectrophotometry. Additional results included a negative direct Coombs test, normal renal function and abdominal ultrasound showing Grade 1 fatty liver with minimal ascites.

Table 1. Key haematology and biochemistry values

Parameter	Admission (17 Dec 2025)	Day 3 (19 Dec 2025)	Day 4 (20 Dec 2025)	Reference Range (Age-appropriate)
Haemoglobin (g/dL)	4.2	6.8 (post 1st PCV)	5.1 (pre 2nd PCV) → 8.9 (post)	11–14
Total WBC count (/µL)	18,400	14,200	12,800	6,000–17,500
Platelet count (lakh/µL)	3.85	3.42	3.70	1.5–4.5
Reticulocyte count (%)	8.5	12.4	9.8	0.5–1.5
Total Bilirubin (mg/dL)	2.8	4.1	3.2	<1.0
Direct Bilirubin (mg/dL)	0.6	0.8	0.7	<0.3
Indirect Bilirubin (mg/dL)	2.2	3.3	2.5	<0.8
Peripheral smear	Polychromasia, anisopoikilocytosis, no schistocytes	Similar findings	Improving	Normal RBC morphology
Methaemoglobin (%)	Not done initially	8.8	Not repeated	0.04–1.5
G6PD (U/g)	6.9	-	-	5-15

Table 2. Management and hospital course

Hospital Day	Date	Key Events/Lab Trends	Interventions	Outcome
Day 1	17 Dec 2025	Hb 4.2 g/dL, severe hypoxia	CPAP oxygen, IV fluids/MVI/vitamin K/ceftriaxone/hydrocortisone; 1st PCV	SpO_2 ~50–60%

Day 2	18 Dec 2025	Haemoglobinuria (dark brown urine)	1-unit FFP	SpO_2 78%
Day 3	19 Dec 2025	Methaemoglobin 8.8 %, rising indirect bilirubin/ reticulocyte count	IV methylene blue 15 mg over 30 min; greenish-blue urine post-dose	SpO_2 90 %, icterus noted
Day 4	20 Dec 2025	Hb drop to 5.1 g/dL	2nd PCV	SpO_2 100 %, pallor improved
Day 5	21 Dec 2025	Stable, normal vitals	Oral feeds resumed; discharge	Full recovery

Figure 1.Chocolate coloured blood of methemoglobinemia

Figure 2.Greenish blue colored urine in urinary catheter and urobag after methylene blue administration

Management and Hospital Course

Supportive management included CPAP oxygen, intravenous fluids, blood products and monitoring. Intravenous methylene blue 15 mg (1.5 mg/kg/dose; body weight 9.6 kg) diluted in 20 mL of 10% dextrose was administered over 30 minutes, following which greenish-blue urine was noted. A second packed-cell transfusion was required because of ongoing haemolysis. The child improved clinically and was discharged in stable condition.

Discussion

Important differential diagnoses considered included acute haemolytic crisis secondary to glucose-6-phosphate dehydrogenase deficiency, autoimmune haemolytic anaemia, haemolytic uraemic syndrome, septic shock with disseminated intravascular coagulation, and congenital causes of cyanosis. The normal G6PD level, negative direct Coombs test, absence of thrombocytopenia or renal dysfunction, and a clear history of mothball ingestion supported the diagnosis of naphthalene-induced methemoglobinemia with oxidative intravascular haemolysis.

Laboratory data confirmed acute intravascular haemolysis, evidenced by falling haemoglobin despite transfusion, elevated reticulocyte count, raised lactate dehydrogenase, undetectable haptoglobin and indirect hyperbilirubinemia, consistent with oxidative haemolysis induced by naphthalene.[1,4]

The measured methaemoglobin level was obtained after referral and not at initial presentation.[5] Therefore, the recorded value of 8.8% may underestimate the peak methemoglobin concentration present during the period of maximum clinical severity. Intravenous methylene blue acts as an electron donor via NADPH-dependent pathways and rapidly reduces methaemoglobin to haemoglobin.[6]

Blood transfusion remains the cornerstone for management of severe haemolytic anaemia and prevents complications such as cardiac failure and hypoxic injury.[4] The absence of acute kidney injury or neurological complications in this patient highlights the benefit of early recognition and timely intervention. This presentation is consistent with reports from developing countries where mothballs remain a common household exposure.[2,3]

Limitations

Certain limitations should be acknowledged. The exact quantity of naphthalene ingested could not be determined from the caregiver's history. Methemoglobin estimation was delayed because the investigation was not immediately available at our center, and repeat methemoglobin measurements could not be performed because of resource limitations. Consequently, correlation between clinical improvement and serial methemoglobin levels could not be established. In addition, conclusions drawn from a single case report have limited generalisability.

Parent/Guardian Perspective

The child's parent expressed relief regarding the favourable outcome and reported increased awareness regarding the safe storage of mothballs and other potentially toxic household substances to prevent similar incidents in the future.

Conclusion

Serial haematological monitoring proved essential in guiding therapy and contributed to the excellent outcome in this case of severe naphthalene toxicity. Paediatricians should maintain a high index of suspicion for oxidative toxins when a child presents with haemolytic anaemia and cyanosis and should promptly arrange methaemoglobin estimation and antidote administration.

Declaration

CARE Compliance: This case report has been prepared in accordance with the CARE Case Report Guidelines.

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