

## Paraphenylenediamine (Blackstone) Poisoning

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### Dear Editor,

Paraphenylenediamine (PPD), also known as “Blackstone,” is an aromatic amine widely used as a primary ingredient in hair dyes due to its strong color properties, low cost, and ease of application. Despite its toxicity, it continues to be commonly used in many low- and middle-income countries, including Pakistan, where regulatory restrictions on cosmetic formulations are limited, and enforcement remains weak. In addition to hair dyes, PPD has occasionally been reported in adulterated food products. PPD is a potent oxidative stress inducer and can cause severe systemic toxicity, including rhabdomyolysis, acute kidney injury, and hepatotoxicity, even in small doses [1, 2]. PPD poisoning has therefore emerged as a significant public health concern in South Asia, where its widespread availability and legal sale contribute to frequent accidental and intentional exposures.

We report a case of a 15-year-old girl from Southern Pakistan who presented to the hospital with a history of ingesting a coloured lollipop (a kind of sugar candy). Within one hour of ingestion, she developed intense abdominal pain, difficulty swallowing, facial swelling, and marked restlessness. Her condition deteriorated rapidly over the next several hours, progressing to respiratory distress, oliguria, and dark-coloured urine consistent with rhabdomyolysis. By the second day of admission, she exhibited worsening renal function, jaundice, and features of multi-organ involvement.

Laboratory investigations are summarized in Table 1. The results demonstrated severe transaminitis consistent with acute hepatocellular injury, markedly elevated CPK and LDH levels indicative of extensive rhabdomyolysis, evidence of acute kidney injury reflected by elevated creatinine and BUN, hematological abnormalities including thrombocytopenia, anemia, and leukocytosis, and profound hypocalcemia likely secondary to massive muscle breakdown. These abnormalities were consistent with the systemic toxicity of paraphenylenediamine (PPD) poisoning. The case was primarily managed

supportively, with early airway protection, gastric lavage, and aggressive hydration.

**Table 1:** Laboratory investigations of a patient with clinically suspected Paraphenylenediamine (Blackstone) poisoning.

Parameter	Result	Reference Range
Hb	9.2 g/dL	11-14.5
WBC	15.4 x 10 <sup>9</sup> /L	4.6-10.8
Platelets	123 x 10 <sup>9</sup> /L	154-433
Total Bilirubin	1.0 mg/dL	0.1-1.2
Direct Bilirubin	0.5 mg/dL	0-0.2
ALT	1651 IU/L	<34
AST	9194 IU/L	<31
BUN	27 mg/dL	4-12
Creatinine	3.0 mg/dL	0.5-1.0
CPK	>200000 IU/L	34-145
LDH	6610 IU/L	135-214
Calcium	6.1 mg/dL	8.6-10.2

PPD has become an increasingly common agent of intentional self-harm in developing countries [3]. An epidemiological study from Punjab reported a rising trend of self-harm using PPD hair dye (*Kala Pathar*), particularly among young females during the last decade [4]. Similarly, in an extensive series of 503 PPD (*Kala Pathar*) ingestion cases, the majority were young females from lower socioeconomic backgrounds, with suicidal intent as the primary cause. Early symptoms included facial edema, dysphagia, and stridor, followed by rhabdomyolysis, hepatic injury, neuropathy, and acute renal failure within 2-5 days [5]. Ingestion can occur accidentally, particularly among children, or be deliberate in cases of self-harm and even homicidal intent. PPD acts as an effective hydrogen donor and undergoes metabolic transformation through electron oxidation, mediated by cytochrome P450 peroxidase, resulting in the formation of a reactive benzoquinone diamine radical. This radical undergoes further oxidation to produce a trimer known as Brandowaski’s base, a compound associated with anaphylactic reactions and significant mutagenic potential [6].

In recent years, the ingestion of PPD has emerged as a growing public health concern, particularly in regions such as Punjab and Sindh in Pakistan, as well as in parts of India and Africa. Despite a government-imposed ban on the sale and distribution of blackstone in several

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districts of southern Punjab in 2017, PPD continues to contribute significantly to cases of illness and death [7]. Similarly, a prospective study from the National Poison Control Centre in Karachi reported that PPD (*Kala Pathar*) poisoning accounted for a substantial proportion of toxicology admissions, with high rates of rhabdomyolysis, renal failure, and mortality. The authors emphasized the urgent need for regulatory enforcement and public health interventions to curb this preventable cause of morbidity and death [8]. This case highlights the dangers of unregulated food coloring agents and underscores the urgent need for increased public awareness and stronger regulatory oversight to prevent such incidents. Healthcare providers should be equipped to recognize PPD poisoning and initiate early supportive interventions promptly. At the same time, public health officials and policymakers must enforce existing bans, regulate cosmetic formulations, and promote community education. Early recognition and timely management remain critical in improving outcomes in PPD poisoning, which continues to pose a significant public health concern in regions where its use is widespread.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Declared none.

#### AUTHORS' CONTRIBUTION

Muhammad Umer Naeem Effendi: Data collection, literature review, and drafting of the initial manuscript.

Syed Bilal Hashmi: Critical revision and intellectual input in manuscript writing.

Sibtain Ahmed: Critical review and approval of the final version.

All authors agree to be accountable for the accuracy and integrity of the work.

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