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Case Report

Paraphenylenediamine (PPD) Poisoning: A Case with a Fatal Outcome

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ABSTRACT

In developing countries, people use Paraphenylenediamine, a highly toxic substance, for suicide and self-harm. It is more common in populations with lower socioeconomic classes and educational backgrounds. The female-to-male ratio is higher. The most common complications are oedema of the upper airway tract and renal failure. The mortality rate is higher due to late hospital presentation and a lack of specific antidotes. The treatment of Paraphenylenediamin poisoning is conservative. In this case report we are presenting Paraphenylenediamine poisoning with a fatal outcome.

Keywords: Black stone, Oedema, Paraphenylenediamine (PPD) poisoning.

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INTRODUCTION

Suicide is the leading cause of death worldwide. [1] In developing countries, toxic substances, especially pesticides, are readily available. Parapheny-lene-diamine (PPD), also known as Black stone or Kala pathar, is emerging as a common method of suicide, especially in the low socioeconomic populations of Asia and Africa. [2] PPD is a highly toxic, odoriferous chemical compound present in hair dye. People commonly use PPD for coloring their hands, feet, and hair in Pakistan and India. The toxicity of PPD is dose-dependent; smaller doses are usually not fatal, and the fatal dose is 7–10 grams. [3] Oral ingestion of PPD leads to the development of angioneurotic edema, cardio-toxicity, rhabdomyolysis, and death within 6–24 hours. Angioneurotic edema manifests as cervico-facial swelling, which further leads to asphyxia and death. [4] There is no specific test to establish diagnosis, and a high index of suspicion is required. No specific antidote is available, and treatment is conservative, including excessive diuresis and timely tracheostomy. [5] In this case report we are presenting Parapheny-lenediamine (PPD) poisoning with a fatal outcome.

CASE REPORT

The patient, a 34-year-old male, has no known comorbid conditions, except a vague history of depressive illness and no documentary evidence of treatment for this disorder. In the afternoon, breathing difficulties brought him to the emergency room (ER). When he presented, he was in respiratory distress. While managing his airway, breathing, and circu-lation, he recounted the intake of a cold drink six hours ago, after which he gradually developed throat pain, followed by difficulty breathing, speaking, and painful leg swelling. He denied any history of allergies or exposure to poisonous substances. His colleagues suspected that he had been under some sort of domes-tic stress recently. On examination, he was con-scious but irritable, with a respiratory rate of 32 breaths per minute, a pulse rate of 126 beats per minute, a BP 115/75 mmHg, and a SpO2 95% at room air initially. He had signs of upper airway obstruction, i.e., a swollen tongue, a swollen oropharyngeal mucosa, and an audible stridor. His shins were swollen, warm, tight, and tender, with a cyanotic tinge. Initially, we suspected laryngeal edema due to anaphylaxis and managed it accordingly with an intravenous steroid, a normal saline bolus, anti-histamine (pheniramine), and intramuscular Adre-naline. Despite all manage-ment, his airway obs-truction kept worsening, indica-ting a need for tracheostomy and mechanical ventila-tion. Nasogastric tube (NGT) couldn't be passed due to gross cervico-facial oedema despite initial manage-ment. Over the next two hours, his metabolic profile revealed a serum creatinine level of 268 umol/L, normal liver function tests, a total leucocyte count of 15x10-9, and a serum creatinine kinase level of 35,690 IU. His doppler venous ultra-sound of his lower limbs ruled out deep venous thrombosis or arterial occlu-sion. The urine catheter showed signs of frank blood and anuria. Inotropic support was necessary due to the com-promised circulatory status. Clinical and

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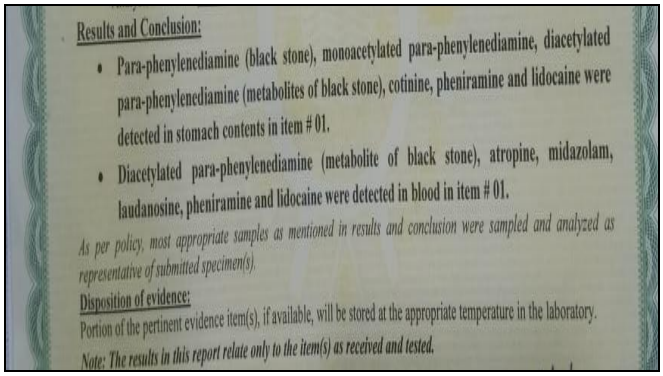
bio-chemical findings led to the suspicion of Black stone poisoning. His hemodialysis couldn't be performed due to hemodynamic instability. The patient expired within 10 hrs of arrival in the ER, in spite of all supportive and resuscitation measures. Subseq-uently, his family revealed his depressive illness and suicidal intentions. They conducted a postmortem to determine the cause of death, which confirmed the suspected diagnosis of Black stone poisoning. His autopsy report (Figure) revealed the detection of PPD and its metabolites in the stomach contents and blood sample.



Results and Conclusion:

- Para-phenylenediamine (black stone), monoacetylated para-phenylenediamine, diacetylated para-phenylenediamine (metabolites of black stone), cotinine, pheniramine and lidocaine were detected in stomach contents in item # 01.
- Diacetylated para-phenylenediamine (metabolite of black stone), atropine, midazolam, laudanosine, pheniramine and lidocaine were detected in blood in item # 01.

As per policy, most appropriate samples as mentioned in results and conclusion were sampled and analyzed as representative of submitted specimen(s).

Disposition of evidence:

Portion of the pertinent evidence item(s), if available, will be stored at the appropriate temperature in the laboratory.

Note: The results in this report relate only to the item(s) as received and tested.

Figure: Autopsy Report of Patient with PPD Poisoning

DISCUSSION

Paraphenylenediamine (PPD) is a very lethal substance; its fatal dose is 7-10 grams, and patients can die within 6–24 hours of ingestion. The most common presentation is swelling of the airway tract and gastro-intestinal system, renal failure, rhabdomyolysis, and shock. In the developing world, the rate of self-harm and suicide by PPD is increasing. According to the literature review, females have a higher suicide rate with PPD than males.[6] The reason behind this higher ratio of females is secondary to domestic abuse in developing countries. [7] According to the literature, the young age group is more vulnerable to self-harm in developing countries and countries with low income. [8] The case we are reporting also involved a young male with financial issues. Khan *et al*. conducted a study which revealed that 71.1% of patients with PPD poisoning were from the lower socioeconomic class, while 28.9% were from the middle class. [9] According to a study by Suliman *et al*., the most common presentation among patients was cervico-facial edema, which needs urgent trache-ostomy to prevent hypoxia.[10] Our patient presented a case similar to this one. The high mortality rate in PPD poisoning is attributed to the scarcity of antidotes and delayed hospital presentation.

A timely decision about securing the airway with a tracheostomy is important in the management of this deadly toxic substance. We should ban the commercial use and sale of this highly toxic substance. To high index of suspicion is required to timely diagnose toxicity due to this lethal substance.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AK: Data acquisition, critical review, approval of the final version to be published.

AR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

KA & LY: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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