

Short Communication

A Prospective Study of 36 Cases of Systemic Poisoning due to Hair Dye Ingestion Treated in a Tertiary Care Hospital

Archana Gupta, Neelima Singh*

ABSTRACT

In view of the large number of patients presenting with hairdye ingestion, it was decided to study these cases so as to diagnose them based on the clinical profile and assess the outcome, in order to reduce mortality by effective management, as there is no antidote for hairdye [containing paraphenylenediamine (PPD)].

A series of 36 patients of acute poisoning due to hairdye ingestion (containing PPD) were observed for toxic effects on various systems. Clinical profile of PPD poisoning was characterized by angioneurotic oedema, chocolate coloured urine, myalgia and subsequently renal failure. Seven patients (19.44%) required tracheostomy for life-threatening angioedema, and in 4 patients (11.1%) with acute renal failure, haemodialysis was performed. Myocarditis was a common accompaniment necessitating cardiac monitoring. Mortality was 11.1% (4 patients).

The major challenge at admission was to ensure patency of airway. Early diagnosis and prompt intervention, such as tracheostomy for severe angioedema, is the cornerstone of management of poisoning with hairdye (containing PPD).

Key Words: Angioneurotic oedema; Hairdye; Paraphenylenediamine; PPD; Renal failure

INTRODUCTION

Hairdye is extensively used by people of all classes in India to enhance cosmetic appearance of aging individuals. The toxic effect is primarily because of its main ingredient - paraphenylenediamine (PPD). This chemi-

cal accelerates and intensifies colour and gives permanent results, and hence commonly used in hair dyes. PPD is an aromatic amine available in the form of white crystals, which rapidly turns dark when exposed to air.

Unique features of PPD poisoning are angioedema of face and neck and severe myalgia. Angioedema, which is a type I hypersensitivity reaction, may range from mild to severe. It is immunologically mediated, and is anatomically limited, as a result of which it can be life threatening, often necessitating tracheostomy in severe cases.¹ Severe myalgia with inability to move the limbs due to pain and tender muscles can be attributed to rhabdomyolysis, and can be confirmed by elevated creatine phosphokinase levels. Kallel et al reported rhabdomyolysis in 100% cases with hairdye ingestion.²

Other features of PPD poisoning include chocolate coloured urine, leucocytosis, myocarditis and renal failure. Clinical severity of myocarditis may range from asymptomatic to fatal. Renal failure is a delayed complication of PPD ingestion, which is usually due to rhabdomyolysis or acute tubular necrosis. Hypovolaemic and direct toxic effect of PPD, or its metabolite, may also contribute to toxicity.^{3,4} Only supportive management can be offered to these patients.⁵

The dye can be detected in the urine by thin layer chromatography on silica gel, which can take a few hours.⁶ The lack of rapid diagnostic testing, however, need not hamper management, as the full-blown clinical picture of hairdye poisoning is very typical, and includes

Dept of Internal Medicine, GR Medical College, Gwalior, Madhya Pradesh.

*(Author for correspondence): "Kamla Bhawan," Dal Bazar Tiraha, Lashkar, Gwalior, Madhya Pradesh.

E-mail: neelimajadon@yahoo.com

angioedema, chocolate coloured urine, myalgia and later renal failure.^{7,8}

MATERIALS AND METHODS

A prospective study was conducted on 36 patients admitted in the emergency department of a tertiary care hospital in North India with history of hairdye ingestion containing PPD. Diagnosis was based on poisoning reported by the patient or his family, and the clinical presentation. Those with consumption of hairdye mixed with alcohol or any other substance were excluded from the study.

Patients were quickly assessed for vital parameters and dealt with accordingly. Activated charcoal was administered when the time of presentation was within a short time after ingestion of the hair dye. All those with severe angioedema were given antihistamines and steroids at admission and reassessed for tracheostomy, which was performed if indicated. After securing the intravenous line and withdrawing blood for routine biochemistries, including creatinine phosphokinase (CPK-MB/Total), intravenous fluids were infused to maintain hydration. Electrocardiogram (ECG) was recorded in all the patients at the time of admission, followed by continuous cardiac monitoring. Catheterization was done in all cases to note the colour of urine and to monitor the output. Management was on supportive lines, as there is no antidote for hairdyes containing PPD.

RESULTS

Thirty-six patients were enrolled and observed for the toxic effect of hairdye (containing PPD) on various systems. Review of prospectively collected data of clinical and biochemical profiles entered in a typed proforma revealed the following:

- Out of 36 patients, 20 (55.56%) were males and 16 (44.44%) females.
- Intention was suicidal in all.
- At admission, angioedema was present in 25 (69.44%) patients and 7 (19.44%) patients required tracheostomy.
- Other clinical features at admission included chocolate coloured urine in 25 (69.44%) and muscle tenderness in 9 (25%) patients.
- Biochemical profile was suggestive of leucocytosis in 22 (61.11%) and elevated liver enzymes in 17 (47.22%) patients. Uraemia was found to be present in 10 (27.78%) patients and 4 (11.11%) patients had to be dialyzed.

- Elevated CPK-MB was noted in 23 (63.89%) patients, while ECG abnormality was recorded in 29 (80.56%) cases. Common ECG changes included ST-T changes in 8 (22.2%), followed by tall T wave in 6 (16.66%) patients. Other changes encountered were bradycardia in 4 (11.11%), tachycardia in 3 (8.33%), and T wave inversion, QTc prolongation and supraventricular tachycardia in 2 (5.55%) patients each.
- Mortality was 11.1% (4 patients). All these patients had angioedema and myocarditis.

DISCUSSION

Hairdye ingestion (containing PPD) mainly leads to respiratory, cardiac, muscular and renal syndromes. Mortality was 11.11% in our study. One patient who died required both tracheostomy and dialysis, second underwent tracheostomy, the third only dialysis, while the fourth who died did not require dialysis nor tracheostomy.

The major challenge at admission was noted to be preservation of patent airway. Angioedema was present in 25 (69.44%) patients and 7 (19.44%) patients required tracheostomy for severe angioedema.

This study also demonstrates the cardiotoxic effect of PPD on myocardium. Myocarditis was evident by the presence of ECG changes and elevated cardiac biomarkers. Most common ECG changes were ST-T changes, although other abnormalities were also noted, including bradycardia, tachycardia, QTc prolongation, atrial premature complexes, and supraventricular and ventricular tachycardias. Myocarditis is most probably due to rhabdomyolysis of myocardium.⁹ Therefore, the importance of cardiac monitoring in hairdye poisoning cannot be overemphasized.

Chocolate coloured urine in 25 (69.44%) patients and muscle tenderness/myalgia in 9 (25%) cases were also due to rhabdomyolysis.¹⁰ Other important abnormalities observed included elevated liver enzymes and leucocytosis. None of the patients presented with acute renal failure at admission. Renal failure was a delayed complication that occurred in 10 (27.78%) patients and 4 (11.11%) patients required haemodialysis. This shows that hairdyes (containing PPD) are an important cause of acute kidney injury.¹¹ Mortality can be minimized by early recognition and prompt treatment.¹²

REFERENCES

1. Ashar A. Acute angioedema in PPD poisoning. *J Pak Med Assoc* 2003;53:120–122.
2. Kallel H, Chelly H, Dammock H, Bahloul M, Ksibi H, Homidia CB, et al. Clinical manifestations of systemic paraphenylenediamine intoxication. *J Nephrol* 2005;18:308–311.
3. Anuradha S, Arora S, Mehrotra S, Arora A, Kar P. Acute renal failure following para-phenylenediamine (PPD) poisoning: a case report and review. *Ren Fail* 2004;26:329–332.
4. Sahay M, Vani R, Vali S. Hair dye ingestion: an uncommon cause of acute kidney injury. *J Assoc Physicians India* 2009;57:743–744.
5. Abdelraheem L, Ali el-T, Hussein R, Zijlstra E. Paraphenylenediamine hair dye poisoning in an adolescent. *Toxicol Ind Health* 2011;27:911–913.
6. Yagi H, el Hind AM, Khalil SI. Acute poisoning from hair dye. *East Afr Med J* 1991;68:404–411.
7. Chrispal A, Begum A, Ramya I, Zachariah A. Hair dye poisoning. An emerging problem in the tropics: an experience from a tertiary care hospital in South India. *Trop Doct* 2010;40:100–103.
8. Ashraf W, Dawling S, Farrow LJ. Systemic paraphenylenediamine (PPD) poisoning: a case report and review. *Hum Exp Toxicol* 1994;13:167–170.
9. Zegwagh AA, Abouqcal R, Abidi K, Madani K, Zekraui A, Karkeb O. Left ventricular thrombus and myocarditis induced by PPD poisoning. *Ann Fr Anesth Reanim* 2003;22:639–641.
10. Huerta Alardin AL, Varon J, Marik PE. Bench-to-Crit - bedside review. Rhabdomyolysis: an overview for clinicians. *Crit Care* 2005;9:158–169.
11. Sahay M, Vani R, Vali S. Hair dye ingestion: an uncommon cause of acute kidney injury. *J Assoc Physicians India* 2009;57: 743–744.
12. Abdelraheem MB, El-Tigani MA, Hassan EG, Ali MA, Mohamed IA, Nazik AE. Acute renal failure owing to paraphenylenediamine hair dye poisoning in Sudanese children. *Ann Trop Paediatr* 2009;29:191–196.