



Original Research Article

A retrospective study of clinical profile of para-phenylenediamene poisoning (hair dye poisoning) in cases admitted in medical college

Kanwal Kamboj¹, Amrita Sinha², Nilam Nigam³, Neha Ahuja^{2*}

¹Dept. of Forensic Medicine, Rama Medical College, Hospital and Research Centre, Kanpur, Uttar Pradesh, India

²Dept. of Pathology, Rama Medical College, Hospital and Research Centre, Kanpur, Uttar Pradesh, India

³Dept. of Pharmacology, Rama Medical College, Hospital and Research Centre, Kanpur, Uttar Pradesh, India



ARTICLE INFO

Article history:

Received 25-07-2022

Accepted 27-02-2023

Available online 13-03-2024

Keywords:

Paraphenylenediamine

Hair dye Poisoning

Tracheostomy

Mortality

ABSTRACT

Background: India has a high suicide rate and a large proportion of these suicides occur through poisoning. Poisoning by Hair dye has been increasing and constitutes a large proportion of the poisoning cases. The principle toxic constituent of Hair dye poisoning is Paraphenylenediamine (PPD).

Materials and Methods: Present study was done by analyzing the demographic profile, clinical presentation, biochemical profile, life saving interventions and mortality in cases of PPD poisoning. This study was conducted on 80 cases.

Results: Angioedema, pain in oral cavity, dark coloured urine, oro-facial edema were main clinical features. Raised TLC count, elevated liver enzymes (sgpt, sgot), elevated serum creatinine, hypocalcemia, elevated bilirubin, low haemoglobin.

Conclusion: Paraphenylene diamine poisoning is developing now days due to easy obtainability and low cheap price. It is more common in poor, illiterate, married females of younger age group living in rural areas. Aggressive treatment and Tracheostomy can save life of Patients.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Agreeing to world health organization (WHO) more than 8 lakh people decease worldwide from suicide every year. This designates an annual global standardized suicide rate 11.4 per 100,000 population.¹ In Asia their figure has doubled in past partial of century.²

Hair dye is accessible in numerous forms and the shared cheap form is stone hair dye which is obtainable in 20 gm pack. Additional branded hair dyes like godrej, kesh kala, supervasmol 33 etc., are available in powder or liquid formulae. The attentiveness of active substance i.e paraphenyl diamine differs from 70-90 % in stone hair dye and 2-10 % in branded dyes which are used for giving black

color to hair. The stone hair dye is tremendously inexpensive and freely available, making it an good-looking option for suicidal intent.^{2,3}

The chemical used in hair dye poisoning is an imitative of paranitro-aniline and is termed paraphenyl diamine (PPD) it is effortlessly solvable in hydrogen peroxide (H₂O₂). PPD is good hydrogen donor & is absorbed by electron oxidation to a lively radical by cytochrome P450 peroxidase to form a sensitive benzoquinone diamine. This is added oxidized to a trimmer known as Brandowaski's base, a compound testified to cause anaphylaxis as well as being powerfully mutagenic.^{4,5} It is conventionally used for dyeing palm and soles along with hinna.

Interaction with PPD causes dermatitis, skin irritation, conjunctivitis, arthritis, asthma, chemosis, lacrimation, exophthalmos and even permanent blindness. Systemic

* Corresponding author.

E-mail address: tissgpl@gmail.com (N. Ahuja).

toxicity happens moreover by percutaneous absorption or oral ingestion.

Ingestion of PPD yields rapid development of edema of face, neck, pharynx, tongue and larynx with respiratory distress which one-time requires tracheostomy. In the later stages, rhabdomyolysis and acute tubular necrosis with acute renal failure and hepatic failure progresses, bleeding tendencies (bleeding from gums), sub-conjunctival hemorrhage and bleeding from mucus membrane also occur.^{6,7} It can also originate renal tubular necrosis which happens due to credits of the toxic metabolites of paraphenyl diamine foremost to high mortality rates which has been stated by some authors as 68.8%⁸ and 60%.⁹

The quantity of PPD that can cause systemic toxicity is only three grams, though the lethal dose is 7 to 10 grams.¹⁰ The sorts of poisoning were experiential with ingesting of even lower volumes such as 25 ml. There is threefold increase in the cases of rhabdomyolysis & hepatitis upon consumption of larger volumes suggesting its dose dependent toxicity. The classical features of acute poisoning were seen in 3-6 hours.¹¹

There is no specific antidote to PPD poisoning. It has fairly tall mortality and hostile management in association with various subjects especially ENT for the need of timely tracheostomy is important.¹²⁻¹⁴

2. Materials and Methods

This study was conducted at Emergency department, I.C.U & Forensic Medicine Department of Rama Medical College, Mandhana, Kanpur. The Study was conducted on patients of period of 3 years from 2018 to 2021. Prospectively collected data of 80 cases of paraphenylendiamine poisoning was studied. Inclusion and exclusion criteria consist of:

2.1. Inclusion criteria

1. Age above 15 years.
2. Patients gave consent.
3. Patients with clear evidence of PPD poisoning

2.2. Exclusion criteria

1. The cases with no clear evidence of exposure to PPD were excluded.
2. Patients having Pre-existing morbid conditions.
3. Eg: Cardiac, Renal, Hepatic Failure.

The recorded observations was analyzed from following points:-

1. Demographic data.
2. Clinical data.
3. Biochemical Profile.
4. Life saving intervention done in patients.
5. Outcome of treatment.

After receiving the patient in emergency, airway, breathing and circulation was assessed and if there is airway obstruction due to swelling immediate tracheostomy usually done. Detailed history is including demographic details, amount and time of ingestion, mode of poisoning etc. Complete Physical examination, all the necessary investigations like CBC, Liver and kidney function tests, X-ray chest, CPK, ABG derangement, complete urine examination, biochemistry of gastric lavage, ECG, Echocardiography, and ultrasound was performed in almost all the patients. Gastric lavage was done in almost all the patients expect those patients in which naso-gastric tube could not passed due to excessive swelling.

Steroids, anti-histamine, antibiotics, forced diuresis, excessive fluid replacement was done in all the patients.

3. Results

There were entire 80 patients out of which 25 remained males and 55 were females. Out of which 42 (52.5%) patients existed in age group of 15 to 25 years and 24 (30%) were between age of 26 to 35 years which constitute major group of patients. Out of 80 patients 47 (58.75%) were Illiterate and 19 (23.75%) has just got primary education. Majority of the cases who consumed PPD were of middle class 40 (50%) or low social economic status 36 (45%). Among cases that consumed PPD 52 (65%) were married and 28 (35%) were unmarried.

Out of 80 patients who consumed PPD 75 cases with intension of suicide and 3 cases were accidental poisoning.

Angioedema was existent in 91.25% cases, pain in Muscles 81.25% cases, vomiting in 86.25% cases, dyspnea in 83.75% cases, facial edema in 90% cases, dark colored urine in 92.5% cases, oligouria in 15% cases and anuria in 10 % cases.

Out of 80 patients 63 were having raised TLC count, elevated blood urea in 38 patients, raised serum creatinine in 38 patients, elevated bilirubin in 55 patients, raised liver enzymes in 50 patients, ABG derangement in 37 patients, albuminuria in 40 patients.

Out of 80 patients tracheostomy was performed in 66 patients. 20 patients existed having pathological results in chest x-ray and 55 patients remained having variations in ECG. Out of 80 patients taken for study 78.75% patients survived and mortality rate is 21.25.

4. Discussion

Poisoning with paraphenylene diamine is developing as an significant means of self-harm with tall mortality rate in emerging countries.^{15,16} In our study witnessed that females were 68.85% and males were 31.15% with a male to female ratio of 1:2.1, which is very alike to many additional studies i.e by Akbar et al¹⁷ and anagram chrismal et al.¹⁸ This may be due to informal obtainability, its use as hair dye and

Table 1: Demographic profile

A. Gender distribution :		
Male	Female	Total
25(31.25%)	55(68.75%)	80(100%)
B. Age distribution :		
Age groups (years)	No. of cases	Percentage
15-25	42	52.5%
26-35	24	30%
36-45	7	8.75%
46-55	4	5%
56 and above	3	3.75%
C. Education level of patients:		
	No of cases	Percentage
Illiterate	47	58.75%
Primary	19	23.75%
Secondary	9	11.25%
Graduate	5	6.25%
D. Marital status of patients:		
	No of cases	Percentage
Married	52	65%
Single	28	35%
E. Socio-economic status:		
	No of cases	Percentage
Low	36	45%
Middle	50	50%
High	4	5%

Table 2: Clinical features of PPD poisoning

Signs & Symptoms	No of cases	Percentage
1. Angioedema	73	91.25%
2. Pain in oral cavity	75	93.75%
3. Vomiting	69	86.25%
4. Dyspnea	67	83.75%
5. Muscle pain	65	81.25%
6. Epigastric pain/ tenderness	53	66.25%
7. Oro-facial edema	72	90%
8. Fits	10	12.5%
9. Hypertension	22	27.5%
10. Dark coloured urine	74	92.5%
11. Oliguria	12	15%
12. Anuria	8	10%

females are more uncovered to gender disparities and social burdens in the developing countries. It was observed that in our hospital most of patients belong to low (45%) and middle (50%) class families. We observed that about 65% cases were married and 35% were unmarried which shows comparable results to a study by Churro et al¹ 43.8% were single and 56.3% were married.

In rural area there is tendency of doing marriage in premature age, which is the main cause that in our study most of the cases were married.¹⁹ About 70% of patients in this study were between 15-30 years of age and these outcomes also parallel with other studies like, Akbar et al¹⁷ reported the mean age as 26.5±4.56 years, Chrismal et al,¹⁸

Table 3: Biochemical parameters

	No of cases	Percentage
1. Raised TLC count (above 11000)	63	78.75%
2. Raised liver enzymes SGPT, SGOT	50	62.5%
3. Raised serum creatinine	38	47.5%
4. Hypocalcemia	30	37.5%
5. Raised bilirubin	55	68.75%
6. Reduced haemoglobin	26	32.5%
7. Prolonged BT & CT	16	20%
8. Thrombocytopenia	25	31.5%
9. Blood urea	38	47.5%
10. ABG derangement	37	46.25%
11. Albuminuria	40	50%

Table 4: Reason of pppd ingestion

Reason	No of cases	Percentage
1. Suicidal	75	93.75%
2. Homicidal	2	2.5%
3. Accidental	3	3.75%

Table 5: Life saving intervention done in patients

Intervention	No of cases	Percentage
1. Tracheostomy	66	82.5%
2. Mechanical ventilation	11	13.75%
3. Dialysis	17	21.25%

Table 6: Outcome of treatment

	Male	Female	Percentage
1. Died	5	12	21.25%
2. Survived	20	43	78.75%

as 27.75 years, Normal and Ganesh,²⁰ 24.7±6.51 years, and Suleiman et al²¹ as 40 years. This outcome is also in agreement with the WHO report that young age group is more susceptible to have self-harm in the low and middle income countries. The general frequency of poisoning is complex in rural areas as associated to the urban areas this may be due to nonexistence of mindfulness and knowledge, poverty, and social problems. In our study 81% cases were from rural upbringing which are similar with many other studies e.g. in a study by Churro ET al,²² all their patients were from rural background. The most shared clinical feature perceived in this study was angioedema and facial swelling tailed by vomiting, dyspnea, and muscle pain. Suleiman ET al,²¹ who stated cervicofacial edema in all their patients with 15.8% necessitating tracheostomy.

Most of the patient who presented with decrease urine output and raised urea, creatinine developed acute kidney injury and some of them needed hemodialysis to survive. In ECG we observed change like ventricular arrhythmias,

AV block, atrial fibrillation, hyperkalemia, negative T-waves and supra-ventricular tachycardia. Tracheostomy was performed in 82.5% patients in this. Mortality rate was 21.25%. Churro et al,²² documented the mortality of 37.5% among the patients in their study, whereas 22.48% mortality has been reported by Jain PK et al.¹⁹

5. Conclusion

Paraphenylene diamine (kala pathar) poisoning is developing now days due to easy accessibility and low-priced. It is more communal in poor, illiterate, married females of younger age group living in rural areas. Belligerent treatment and tracheostomy can save life of patients.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Acknowledgement

The authors thanks Rama medical college Hospital & Research Centre management for support of study and medical record department of Rama Hospital for providing all the records.

References

- Churro BA, Khaskheli MS, Sheikh AA. Paraphenylene diamine poisoning: our experience at PMC Hospital Nawabshah. *Anapest Pain Intense Care*. 2012;16(3):243–46.
- Sampathkumar K, Yesudas S. Hair dye poisoning and the developing world. *J Emerg Trauma Shock*. 2009;2(2):129–31.
- Kalel H, Chilly H, Dammar H, Bailout M, Kisi H, Hamada CB, et al. Clinical manifestations of systemic paraphenylene diamine intoxication. *J Nephron*. 2005;18(3):308–11.
- Sony SS, Agaric AP, Deniker M, Dailey GK, Raman A. Systemic toxicity of paraphenylene diamine. *Indian J Med Sci*. 2009;63(4):164–6.
- Laila AH. Histopathological alterations in renal tubules of female rats topically treated with Paraphenylene diamine. *World Apple Sic J*. 2012;16(3):376–88.
- Schnook A, Geiger J, Utter W, Frisch PJ, Lehmacher W, Abider W, et al. National rates and regional differences in sensitization to allergens of standard series. *Contact Dermatitis*. 1997;37(5):200–9.
- Saito K, Murray T, Yabe K, Hare M. Rhabdomyolysis due to paraphenylenediamine (hair dye)—report of an autopsy case. *Nihon Hoigaku Zasshi*. 1990;44(5-6):469–74.
- Khuhro BA, Khaskheli MS, Sheikh AA. Paraphenylene diamine poisoning: Our experience at PMC Hospital Nawabshah. *Anaesth Pain Intensive Care*. 2012;16(3):243–6.
- Soni S, Nagarik A, Gopalkishan A. Anuradha Supervasmol 33 poisoning- Abstract presented at the 38th Annual conference of Indian society of Nephrology; 2007.
- Bowen DA. A case of phenylenediamine poisoning. *Med Sic Law*. 1963;3:216–9.
- Rao C, Nagaraju S. Super vasmol (hair dye) Poisoning- Tracheostomy Life Saving Procedure. *Indian J Appl Res*. 2016;6(6):552–4.
- Kalel H, Chilly H, Dammar H, Bailout M, Kisi H, Hamada CB, et al. Clinical manifestations of systemic paraphenylene diamine intoxication. *J Nephron*. 2005;18(3):308–11.
- Sheik NA, Jayasundaram E. Gastric lavage in hair dye (Super-Vasmaol 33) poisoning: A friend or foe. *J Emerg Trauma Shock*. 2012;5(3):276. doi:10.4103/0974-2700.99712.
- Azhar A. Acute angioedema in paraphenylene diamine poisoning. *J Pak Med Assoc*. 2003;53(3):120–2.
- Gag SK, Tiwari R, Ahlawat A. Hair dye poisoning: An unusual encounter. *Indian J Crit Care Med*. 2014;18(6):402–4.
- Sakuntala P, Khan PM, Sedaris B, Menorah S, Sideward R, Swoop K, et al. Clinical profile and complications of hair dye poisoning. *Into J Sic Res Pub*. 2015;5(6):1–4.
- Akbar MA, Khaliq SA, Malik NA, Shah A, Train SM, Chaudhary GM, et al. Kala Pathar Paraphenylene diamine intoxication. *Nishtar Med J*. 2010;2:111–5.
- Anagram C, Anissa B, Ramie 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(2):100–3.
- Jain PK, Sharma AK, Agarwal N, Jain PK, Sengar NS, Agarwal N, et al. A prospective clinical study of myocarditis in cases of acute ingestion of paraphenylene diamine (hair dye) poisoning in northern India. *J Assoc Physicians India*. 2013;61(9):633–6.
- Normal M, Ganesh R. Hair dye - an emerging suicidal agent: our experience. *Online J Otolaryngol*. 2012;2(2):163–80.
- Suleiman SM, Fadlalla M, Nasr MM, Beliel MH, Fesseha S, Babiker M, et al. Poisoning with hair dye containing Paraphenylene Diamine: ten years' experience. *Saudi J Kidney Dis Transpl*. 1995;6(3):286–9.
- Churro BA, Khaskheli MS, Shaikh AA. Paraphenylene diamine poisoning: our experience at PMC Hospital Nawabshah. *Anapest Pain Intensive Care*. 2012;16(2):243–6.

Author biography

Kanwal Kamboj, Assistant Professor

Amrita Sinha, Assistant Professor

Nilam Nigam, Professor

Neha Ahuja, Assistant Professor

Cite this article: Kamboj K, Sinha A, Nigam N, Ahuja N. A retrospective study of clinical profile of para-phenylenediamene poisoning (hair dye poisoning) in cases admitted in medical college. *Panacea J Med Sci* 2024;14(1):164-167.