ORIGINAL ARTICLE

CLINICAL PRESENTATION AND OUTCOME OF PATIENTS WITH PARAPHENYLENEDIAMINE (KALA-PATHAR) POISONING

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ABSTRACT

Background: Paraphenylenediamine (kala pathar) poisoning is an emerging way of self-harm in developing countries. The objective of this study was to explore the clinical course and outcome of patients with this poisoning.

Material & Methods: This case series was observed at Medical Unit B, DHQ Teaching Hospital, D.I.Khan, Pakistan over a period of two years from September 2013 to August 2015. Demographic details, clinical manifestations, complications, and outcome of patients with paraphenylenediamine poisoning were noted.

Results: Thirty-eight patients were observed during the study period with male to female ratio of 1:18 and mean age of 22.08±6.42 years. Among 38 patients 27(71.1%) were unmarried, 27(71.1%) of low socioeconomic class, 28(73.7%) illiterate, and 23(60.5%) rural dwellers. Suicidal intention was identified in 36(94.74%) cases. Dysphagia was noted in 38(100%), cervicofacial oedema in 36(94.7%), dysponea in 36(94.7%), haematuria in 8(21.1%) and stridor in 7(18.4%) cases. Rhabdomyolysis was observed in 22(57.9%), acute renal failure in 15(39.5%), and shock in 10(26.3%) cases. The mortality rate was 47.4%.

Conclusion: Paraphenylenediamine (kala pathar) poisoning is more common in poor, illiterate, unmarried females of younger age group living in rural areas in our set-up and is associated with very high mortality.

KEY WORDS: Paraphenylenediamine; Poisoning; Hair dyes; Deliberate self-harm; Suicide.

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INTRODUCTION

According to World Health Organization (WHO) more than 800,000 persons die worldwide from suicide each year. This indicates an annual global age-standardized suicide rate of 11.4 per 100,000 population.[1] Poisoning is commonly used for deliberate self-harm in the developing countries. The toxicity of available poisons and paucity of medical services lead to mortality from self-poisoning far greater in the developing countries as compared to the high income or developed ones.[2] Although pesticide poisoning is a leading cause, but poisoning with paraphenylenediamine (PPDA) is also emerging as an important means of intentional self-harm in the developing countries.[3-9]

PPDA is an organic compound with chemical formula $C_6H_4(NH_2)_2$. It is a white solid, but it darkens on oxidation. It is mainly used as a component of engineering polymers and composites. It is widely used in the developing countries as a hair-dye. In Pakistan it is called kala-pathar which means 'black stone' in Urdu and other local languages. Poisoning with PPDA when ingested presents with severe cervicofacial oedema, rhabdomyolysis and intravascular haemolysis leading to myoglobinuria and hemoglobinuria culminating in acute renal failure (ARF).[6,7] There is no specific antidote to PPDA and it is non-dialyzable. It has quite high mortality and aggressive management in collaboration with various specialties especially ENT for the need of early tracheostomy is important.[6-15]

Research to better understand and improve the management including effective and timely interventions especially tracheostomy can reduce the number of deaths from this type of self-poisoning in the developing world.[6] The objective of this study was to explore the clinical course and outcome of patients with paraphenylenediamine poisoning.

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MATERIAL AND METHODS

This case series was observed at Medical Unit B, DHQ Teaching Hospital, D.I.Khan, Pakistan over a

period of two years from September 2013 to August 2015.

All patients admitted with kala-pathar poisoning were included in the study. Those having a history of mixed poisoning were excluded from the study. Consent was taken from the patient or attendant and confidentiality was ensured. Approval from the local Ethical Committee was obtained.

The demographic details like age, gender, marital status, socio-economic status, education, and residence were recorded. Also the reason for intoxication, time to reach the hospital, clinical manifestations, complications, need for tracheostomy and outcome were noted.

Standard treatment was started immediately in the form of oxygen inhalation, intravenous fluids, antihistamines, parenteral steroids, and antibiotics. Tracheostomy was performed in cases with severe sublingual and submandibular oedema to keep the airway patent. Intake-output record was maintained and investigations including full blood count, urinalysis and microscopy, blood urea, creatinine, electrolytes, calcium, liver function tests, creatinine phosphokinase (CPK) and blood sugar were performed and repeated as required. The data was collected on a structured proforma and analysed by Statistical Package for Social Sciences (SPSS) version 20.

RESULTS

Thirty-eight consecutive patients with PPDA poisoning were observed during the study period. Among these, 2 (5.3%) were males and 36 (94.7%) females, with a male to female ratio of 1:18. (Fig. 1)

The age range was 30 years (15 to 45), with a mean age of 22.08±6.42 years. The majority of patients 25 (65.8%) were between 15 to 24 years, 10 (26.3%) patients were 25 to 34 years, and only 3 (7.9%) were ≥35 years of age. (Table 1)

Regarding the marital status 27 (71.1%) were unmarried while 11 (28.9%) were married. In respect to socioeconomic status 27 (71.1%) were of low, 11 (28.9%) middle, and no patient was of high socioeconomic class. Regarding the educational level 28 (73.7%) were illiterate, 9 (23.7%) matriculate, and only one (2.6%) patient was graduate. Regarding residence 15 (39.5%) were urban and 23 (60.5%) were rural dwellers. (Table 2)

Regarding the reason of poisoning, suicidal intention was identified in 36 (94.74%), while only 2 (5.26%) patients had accidental poisoning. The time to reach the hospital ranged from one hour to 24 hours with a mean of 4.68±5.31 hours.

Cervicofacial oedema was present in 36 (94.7%) patients, dysphagia in 38 (100%), dysponea in 36 (94.7%), stridor in 7 (18.4%) and haematuria in 8 (21.1%) cases. Rhabdomyolysis was observed in 22 (57.9%), ARF in 15 (39.5%) and shock in 10 (26.3%) patients. Tracheostomy was performed in 29 (76.3%) patients with cervicofacial oedema. (Fig. 2) Regarding the outcome, 20 (52.6%) patients recovered while 18 died showing the mortality rate of 47.4%. (Fig. 3)

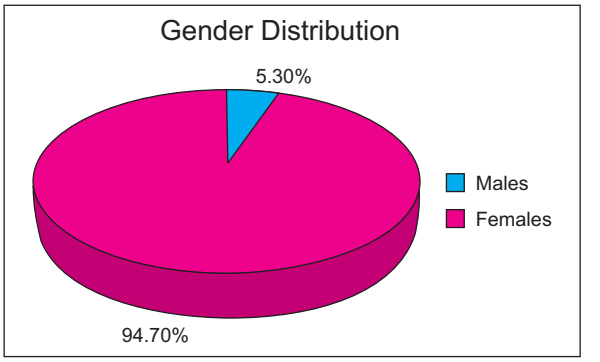

Figure 1: Gender distribution of patients with paraphenylenediamine poisoning (n=38).

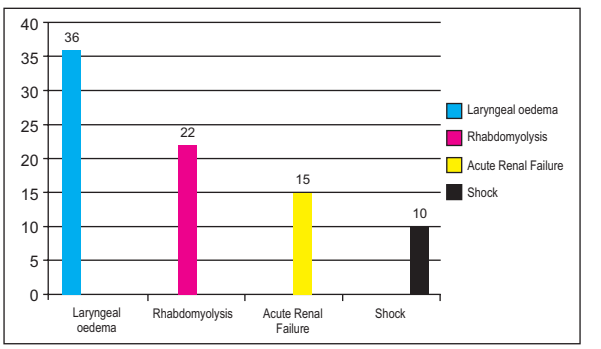

Figure 2: Frequency of complications with paraphenylenediamine poisoning (n=38).

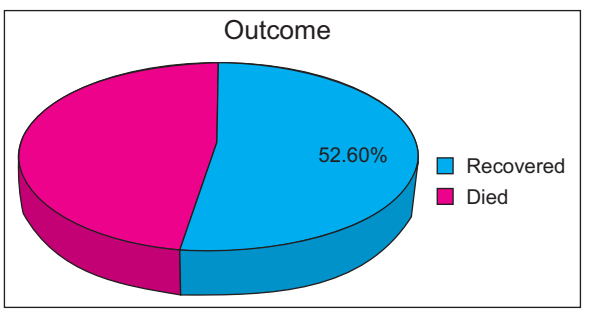

Figure 3: Outcome of patients with paraphenylenediamine poisoning (n=38).

Table 1: Age distribution of patients with paraphenylenediamine poisoning (n=38).

Age range (years)	Frequency	Relative Frequency	Cumulative Frequency
15-24	25	65.8	65.8
25-34	10	26.3	92.1
≥35	3	7.9	100

Table 2: Marital, socioeconomic, educational and residential status of patients with paraphenylenediamine poisoning (n=38).

Variable		Frequency	Relative Frequency
Marital status	Unmarried	27	71.1
	Married	11	28.9
Socioeconomic status	Low	27	71.1
	Middle	11	28.9
	High	0	0
Education	Illiterate	28	73.7
	Primary	9	23.7
	Graduate	1	2.6
Residence	Urban	15	25
	Rural	23	75

DISCUSSION

Poisoning with PPDA is emerging as an important means of intentional self-harm with high mortality rate in many developing countries.[2-6] The objective of this study was to explore the clinical course and outcome of patients with this poisoning.

It was observed that the female gender was primarily affected by this poisoning with male to female ratio of 1:18. A study from Sudan by Suliman et al[6] reported this ratio as 1:4. A study from Hyderabad, India by Sakuntala et al[16] reported it in females 80.64% as compared to males 18.75%. A study by Nirmala and Ganesh[17] also showed female preponderance with a male to female ratio of 1:1.84. A study from Multan, Pakistan by Akbar et al[4] also showed similar results. All the five patients in their series were females. The explanation for female preponderance could be the use of kala-pathar as a low cost and easily available hair dye. Besides this, females are more exposed to gender inequities and social pressures in the developing countries.

It is obvious from the results of this study that young age-group (mean 22.08±6.42 year) is the main sufferer of kala-pathar poisoning. It is consistent with many other studies. Akbar et al[4] reported the mean age as 25.5±4.56 years, Chrispal et al[5] as 27.75 years, Nirmala and Ganesh[17] 24.7±6.51 years, and Suliman et al[6] as 40 years. This finding is also in accordance with the WHO report that young age group is more vulnerable to have self-harm in the low and middle income countries.[1]

In this study, 71.1% patients were unmarried. In a study by Khuhro et al[18] 43.8% were single while 56.3% married. These results are in contradiction to our findings. The reason could be that their study was from Sindh province where early marriages are quite common.

In our study, 71.1% patients were of low socioeconomic status, 28.9% middle and none from high socioeconomic class. Khuhro et al[18] reported 93.8% patients from the low, 6.3% middle and no patient from high socioeconomic stratum. In the study by Akbar et al[4] all the patients were from low social class. Results of all these studies are in agreement with ours.

Regarding the education, 73.7% were illiterate, 23.7% matriculate, and only 2.6% were graduates. Educational level in patients with kala-pathar poisoning was studied for the first time and it could not be compared with other studies. Regarding residence 39.5% were urban and 60.5% rural dwellers. In the study by Khuhro et al[18] all their patients were from rural background.

A high proportion of PPDA intoxication i.e. 94.74% was based on suicidal intention in our study which favours the contribution of social factors toward this event. This finding is consistent with other studies; Akbar et al[4] from Pakistan identified suicidal intention in 60%, Nirmala and Ganesh[17] from India 90% and Suliman et al[6] from Sudan 84%. This shows that PPDA as accidental intoxicant is not common in the developing world.

The mean time to reach the hospital was 4.68±5.31 hours. This finding is consistent with that of Nirmala and Ganesh[17] who reported it as 4.63±1.73 hours. Upper airway obstruction due to cervicofacial oedema is the most serious and common manifestation which needs urgent tracheostomy. It was present in 94.7% in our series and 76.3% required tracheostomy. This finding is similar to Suliman et al[6] who reported cervicofacial oedema in all their patients with 15.8% requiring tracheostomy.

Rhabdomyolysis was observed in 80% patients with 40.5% developing ARF. Suliman et al[6] reported ARF in 60% of their patients. Shock was another important feature due to PPDA poisoning which occurred in 18.5% of our series. Khuhro et al[18] in a study of 16 patients from Nawabshah reported it in 81.3% patients.

The mortality rate in our series was 47.4%. This rate is very high but comparable with other studies. Khuhro et al[18] reported it as 37.5%, Kallel et al[8] 31.6%, Nirmala and Ganesh[17] 22.2%, Akbar et al[4] 20%, and Sakuntala et al[16] 12%. The reasons for very high mortality rate may be the lack of antidote and timely interventions especially tracheostomy.

CONCLUSION

Paraphenylenediamine (Kala-pathar) poisoning is more common in the poor, illiterate, unmarried females of younger age group mostly living in the

rural areas in the developing countries. It is associated with very high mortality. Laryngeal oedema, and acute renal failure are the major complications. Intensive supportive care and timely intervention including tracheostomy is the corner stone of management.

Public awareness is needed to discourage the use of kala-pathar as hair dye and its easy availability. Also there is a need for research to find an effective antidote for PPDA.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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None declared.

AUTHORS' CONTRIBUTION

Conception and Design	NK, HK, NK, IA
Data collection, analysis and interpretation	NK, HK, NK, IA, FS, AUR, IM
Manuscript writing and Revision	NK, HK, NK, IA