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FREQUENCY OF ACUTE RENAL FAILURE IN BLACKSTONE POISONING

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ABSTRACT… **Objective:** To determine the frequency of acute renal failure in patients presented with Blackstone poisoning at tertiary care Hospital. **Study Design:** Cross sectional study. **Setting:** Medical wards and ICU at Peoples Medical College Hospital, Nawabshah. **Period:** September 2017 to March 2018. **Material & Methods:** All the patients of age 20 to 50 years having Paraphenylenediamine (PPD) poisoning (kala-patthar) during ≥6 hours after ingestion and either of gender were included. AKI was labelled as positive if either of any stage was present on the basses of urine output measurement for 24 hours through urine beg or urine output (UO) criteria. All the data was documented in self-made proforma. **Results:** The mean age for patients was 24.9±8.9 years, 46(19.08%) subjects were male and 195(80.91%) were female. 18(7.5%) study subjects had acute renal failure, out of them 6 study subjects had ARF of stage I, 5 patients had stage II and 7 study subjects had acute renal failure stage III. **Conclusion:** Acute renal injury is a common complication following PPD ingestion Paraphenylenediamine toxicity is a threat to the region of Asia and is evolving as a substitute to the poisoning of organophosphorus due to its easy accessibility and low cost.

Key words: Acute renal failure, Blackstone poisoning, Urine output adults.

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INTRODUCTION

In Pakistan and other Asian countries, Black stone i-e; Paraphenylenediamine (PPD) is an agent used in hair dyes and Henna. This is also commonly called as Kala Pathar. It is most commonly used suicidal agent especially in Pakistan and India with the mortality rate ranging from 0.03-0.05% to 37.5%.[1-6] However worldwide it has rarely been reported.[6] PPD is associated with major life threatening complications like angioedema, laryngeal edema, respiratory failure, arrhythmias which occur initially in 4-6 hours, however the manifestations presenting late i-e; >6 hours- 12 hours are hyperkalemia (87.5%)[7], upper airway tract edema (68.4%)[8], metabolic acidosis (84.6%)[9], myocarditis, rhabdomyolysis (37%)[7], acute renal failure (18%)[7]and intravascular hemolysis. The clinical manifestations are directly correlated with amount of PPD, duration of ingestion and severity of complication.[7-10] Elgamel et al found respiratory distress in 22.5%, acute renal failure in 20.5%, cardiac complications in 1% and hepatic problems in 0.5% of patients.[11] Severe angioneurotic edema develops in 4-6 hours followed by muscle pain in 12 hours and then rhabdomyolysis and muscle necrosis. Acute renal failure is the late manifestation developed after rhabdomyolysis and acute tubular necrosis.[12] Khuhro et al has found 37.5% patients developing acute tubular necrosis and of them 12.4% patients developing acute renal failure after 72 hours.[13] Acute renal failure usually occurs after moderate doses of PPD, however angioedema and hepatitis occurs on milder doses.[13] PPD in hair dyes is available in the concentration of 0.2% to 3.75%, and the lethal dose is 7-10 grams, while only 3 gms are associated with systemic toxicity.[14] Another case report by Bokutz et al has found rhabdomyolysis together with laryngeal edema to be fatal complications of PPD.[15] Prevalence of ARF is 6% in patients with Blackstone poisoning.[16] Suicide is an avoidable public health concern, responsible for thousands of deaths globally per annum, and poisoning seems to

be an ideal approach of committing suicide, which is among the major challenges faced in hospitals' emergency departments. Poisoning by PPD ingestion in numerous underdeveloped countries of Africa and Asia is a growing trend of deliberately harming oneself and is correlated with high mortality and morbidity. Thus, this study intended to identify acute kidney failure rate in patients presented with Blackstone poisoning.

MATERIAL & METHODS

This was a cross-sectional study and conducted at ICU and Medical wards at Peoples Medical College Hospital, Nawabshah after approval of ethical committee. Study duration was six months from September 2017 to March 2018. All the patients of age 20 to 50 years, having Paraphenylenediamine (PPD) poisoning (kala-patthar) during ≥6 hours after ingestion and either of gender were included. Patients on multiple drugs simultaneously with PPD kalapathar were conformed through history; patients with other associated medical conditions like hypertension (BP>140/90mmHg), asthma as per record or deranged LFT (ALT>40IU, AST>40IU), deranged RFT (creatinine>1.2mg/dl) or anaemia (Hb<10mg/dl) and patients with previous cardiac problem or prolonged use of heparin or anticoagulants were excluded. Informed consent was taken from patients or their attendants. After being admitted to ICU or medical ward, patients were managed conservatively i.e., on arrival, each patient received parenteral steroids, antihistamines, sodium bicarbonate and gastric lavage, because, yet there is no specific antidote accessible for it. AKI was labeled as positive if either of any stage/s mention below were present on the basses of urine output measurement for 24 hours through urine beg or urine output criteria as: Stage 1: UO > 0.5ml/kg/hr in 6 hours. Stage 2: UO > 0.5ml/kg/hr in 12 hours. Stage 3: UO > 0.3ml/kg/hr in 24 hours or anuria × 12 hours. Performa was filled accordingly. SPSS.20 was used for statistical analysis.

RESULTS

Total 241 patients were enrolled, their mean age was 24.9±8.9(20-50) years, Mean duration of ingestion of poison was 8.9±10.9(6-72) hours, mean volume consumed was 75.2±38.4 ml. 46(19.08%) study subjects were male and 195(80.91%) were female patients. 148(61.41%) patients were illiterate and 93(38.58%) were literate, 103(42.73%) patients were unmarried, 94(39%) married, while 44(18.25%) were divorced and widows or separated. Table-I.

Out of 18 study participants of ARF, 6(33.33%) subjects had ARF of stage 1, 5(27.8%) patients had stage 2 and 7(38.9%) study subjects had ARF of stage 3. Table-II.

Stratification for ARF was done with respect to age and gender. There was age >30 years and male gender were significantly associated with acute renal failure, p-values were quite significant, results showed in Table-III.

DISCUSSION

Para phenylene-diamine is a very potent poison employed for dyeing of hairs. It is very toxic to the human cells with lethal effects on different organs that results in rhabdomyolysis, myocarditis and angioneurotic edema. It is a growing method of self-poisoning because of its wide accessibility and low price. In our study, patients' mean age was 24.9±8.9 years. 46(19.08%) study subjects were males and 195(80.91%) were females. In comparison to our results, Naqvi R et al[17] reported that mean age of their patients was 23.11 ± 7.94 years and acute kidney injury was caused by toxic rhabdomyolysis as suggested by a significant increase in muscle enzymes with mean creatinine. Shigidi M et al[18] also reported a mean age of 25.6 ± 4.2 years with 93.3% females in majority and suicide due to PPD exposure was found in 86.7% cases.

The mean onset time for kidney symptoms was 34.8 ± 7.6 hours, the maximum median plasma creatinine was 8.6 ± 2.3 milligrams / dl, 86.7 percent had renal dysfunction as shown in the RIFLE distribution and dialysis was considered necessary. Rawat R et al[19] reported females in majority with 21-30 years of age group and 58.46% cases were presented with Nephro-toxicity.

Variables		Frequencies(n)	Percentages
Gender	Male	46	19.08%
	Female	195	80.91%
Educational status	Illiterate	148	61.41%
	Literate	93	38.58%
Marital status	Unmarried	103	42.73%
	Married	94	39.0%
	Others	44	18.25%
Socioeconomic Class	Lower	105	43.56%
	Middle	84	34.85%
	Upper	52	21.57%
Age (mean±SD)		24.9±8.9 years	
Duration poisoning (mean±SD)		8.9±10.2 hours	
Estimated volume consumed (mean±SD)		75.2±38.4ml	

Table-I. Distribution of demographic variables (n=241)

Variables		Frequency(n)	Percentages
ARF (n=241)	Yes	18	7.5%
	No	223	92.5%
Stages (n=18)	1	6	33.3%
	2	5	27.8%
	3	7	38.9%

Table-II. Distribution of ARF and stages (n=241)

		ARF		Total	p-value
		Yes	No		
Age	Less or 30 years	6(4.3%)	134(95.7%)	140(100.0%)	0.027
	More than 30 years	12(11.9%)	89(88.1%)	101(100.0%)	
Total		18(7.5%)	223(92.5%)	241(100.0%)	
Gender	Male	8(17.4%)	38(82.6%)	46(100.0%)	0.004
	Female	10(5.1%)	185(94.9%)	195(100.0%)	
Total		18(7.5%)	223(92.5%)	241(100.0%)	

Table-III. Stratification for acute renal failure with respect to age and gender (n=241)

Khan MA et al[20] showed that in their study; females were 814 (64.7%) and males were 444 (35.3%), with an age range of 5 - 63 years and 21 years of median age. In this study, most study subjects 148(61.41%) were illiterate and the findings revealed a reciprocal association between the level of socioeconomic and educational status and Kala-Pathar poisoning, because Kala-Pathar intake was more common among the individuals with low socioeconomic status and lower education. Findings of other studies carried out in India and Pakistan, were consistent with ours.[21] In present study, unmarried young females remained in majority, which is supported by prior reports published in Sudan.[22,23] This may be because of unemployment, social insecurity, stress and overall less maturity in this age group. Females were affected more by intoxicating hair dyeing products. This can be explained by higher exposure of females to PPD contrasted to males, because henna is being used in skin cosmetics and in other cosmetics to enhance hair blackening. In

this series, 42.73% subjects were unmarried while 39% were married patients. These findings are in line with nearly all the studies carried out in Asia and Africa.[24] Furthermore, these outcomes are as well compliant with the self-harm report of WHO for low and middle income nations.[25] The males to females ratio in adults is nearly similar to some local studies of Qasim et al. [21] and Shakuntala et al.[26] But, some studies from Africa and India revealed female victims much more than the findings of this study. Hair dye contains PPD at different ratios from 0.2 to 3.75 percent. PPD is a toxic substance that causes laryngeal edema, severe metabolic acidosis, rhabdomyolysis, and AKI following hair dye poisoning.[27]

In our study, 7.5% had ARF in which 33.33% study subjects had ARF of stage 1, 27.8% patients had stage 2 and 38.9% study subjects had ARF of stage 3 while Abdelrheem MB et al[28] showed renal failure in 71%. Another study conducted by Chugh et al.[29] also documented two cases with acute oliguric kidney failure after intoxication by PPD. Paraphenylenediamine toxicity is a threat to the region of Asia and is evolving as a substitute to poisoning of organophosphorus due to its easy accessibility, bitterness and low cost. Hair dye toxicity in Pakistan seems to be a unusual causal factor of poisoning, initial appearance could be misleading and the majority of deaths can take place within hours of intake. Therefore, diagnosis needs a high suspicion index as clinical characteristics are unique. Early identification and therapy with particular focus on respiratory control and treatment/prevention of kidney failure is crucial for administrators. Given the growing prevalence of toxicity with this toxic substance, primary healthcare physicians, nephrologists and critical care physicians should be aware of this condition's different manifestations and administrative strategies.

CONCLUSION

Acute renal injury is a common complication following PPD ingestion. Clinical scenarios are based on prompt referral, early recognition, and aggressive treatment in support. Toxicity consciousness programs must be introduced at various levels. It is suggested that strong regulation and limitation of PPD sales besides consciousness. More such studies must be produced in peer-reviewed publications in order to persuade the officials and policymakers to give guidance.

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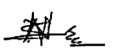
2	Waseem Raja Memon	Manuscript review.	
3	Nasrullah Aamer	Data analysis and manuscript writing.	
4	Bahkat Ali Sial	Participation in data collection.	
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