Original Article

Paraphenylene Diamine (Kala Pathar) Poisoning Cases at Bahawalpur – A Five Years Analysis

Paraphenylene Diamine Poisoning

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ABSTRACT

Objective: To analyse the Paraphenylene Diamine (Kala Pathar) poisoning cases coming at A&E Department B.V Hospital Bahawalpur with regard to demographic profile, frequency, morbidity and mortality.
Study Design: Retrospective Study
Place and Duration of Study: This study was conducted at the A&E Department B.V Hospital Bahawalpur, covering a span of five years. i.e 1st January 2017 to 31st December 2021.
Materials and Methods: Data of a total of 2995 cases was analysed from 1st January 2017 to 31st December 2021 with regard to age and gender distribution, morbidity and mortality.
Results: Out of 2996 cases, most common age group is 20-40 years n=1885, the female predominance of 72% is noted among all cases. Common complications noted are cervico-facial edema (87.89%), rhabdomyolysis (45.55%), acute renal failure (33.75%) and shock (13.67%). The mortality rate calculated as 10.45%.
Conclusion: To conclude, it is evident that the most commonly involved age group is 20-40 years with an overwhelming female predominance. Cervico-facial edema is most common complication and the mortality as a result of these complications is 10.45%.
Key Words: Paraphenylene Diamine (PPD) Poisoning, Cervico-facial edema, Rhabdomyolysis

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INTRODUCTION

Poisons are known to human being from times since immemorial, they cause ailments not only in animal kingdom but also in plants.[1] The medicolegal significance of suicidal, homicidal and accidental poisoning cannot be over emphasized. According to WHO, there are about 2 million people who are affected due to suicidal attempts due to poisons while incidence of accidental poisoning mount to 1 million globally.[2] In South Asia, suicidal attempts due to poisons are calculated as 35.3% which is second only to hanging (55.8%).[3]

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Paraphenylene Diamine (Kala Pathar) is used as an active ingredient for hair dyes. It is also used in Hinna (Mehndi) to potentiate its effect on skin.[4,5] Easy access from the market at economic rates make Paraphyenylene Diamine a common cause of poisoning as compared with western world and Pakistan is no exception to these emerging trends.[6,7]

Physically, Paraphenylene Diamine (PPD) is white crystalline solid which converts to dark colour when exposed to external environment. When applied to skin at large concentrations PPD causes anaphylactic reaction with capillary leakage and mast cell destabilization. While the ingestion of Kala Pathar may cause Cervico-facial edema, rhabdomyolysis leading to acute renal failure and shock.[8] The diagnosis of rhabdomyolysis can be established according to RIFLE criteria by four times rise in Creatinine Kinase (CK) and Lactate Dehydrogenase (LDH) levels.[9] Studies have shown that these complications are caused as a result of conversion of PPD to benzoquinone diamine under the action of cytochrome P450.[10]

A study conducted in Bahawalpur reported 1258 patients over a span of 16 months (From January 2016 to April 2017), which was an alarming situation for the health care authoirties.[5] The present study was conducted to analyse the trends of poisoning due to this poison in past 5 years with regard to demographic profile, frequency, morbidity and mortality.

MATERIALS AND METHODS

A total number of 2996 cases were analysed covering a period of five year i.e from 1st January 2017 to 31st December 2021, which were presented with history of Paraphenylene Diamine poisoning at accident and emergency department B.V Hospital Bahawalpur. All those cases that were brought to accident and emergency department after death, were excluded from the study. A performa was designed to note the complications and outcome caused by PPD poisoning.
Data was analysed on SPSS v 22.0. Frequency and percentage was calculated for age group and gender. Effect modifiers like age and gender were controlled through stratification.

RESULTS

Data of 2996 cases was recorded starting from 1st January 2017 to 31st December 2021.
Table-1 communicates that most common age group is 20-40 years n=1885 (24.8%), while >40 years of age have shown least number of cases n=371(12.3%). 2017 had seen maximum number of PPD poisoning cases n=1243 with female predominance of 70.4%, while minimum number of cases was noted in 2020 n=159.

Table No.1: Age Groups with Gender Distribution

Age (Years)	2017		2018		2019		2020		2021		Total
	M	F	M	F	M	F	M	F	M	F	
< 20	115	269	118	164	4	12	3	6	16	33	740 (24.8%)
20-40	176	424	257	374	42	146	49	76	113	228	1885 (62.9%)
> 40	77	182	23	32	3	12	10	15	6	11	371 (12.3%)
Total	368 29.6%	875 70.4%	398 41.1%	570 58.9%	49 22.3%	170 77.7%	62 38.9%	97 61.1%	135 33.2%	272 66.8%	2996 Mean 24.67 ± 7.32

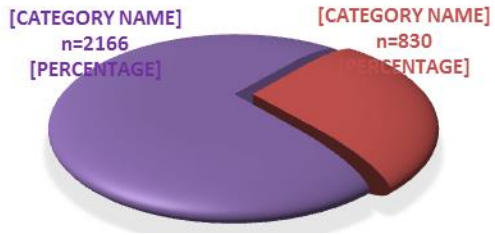

Figure No.1: Gender Distribution

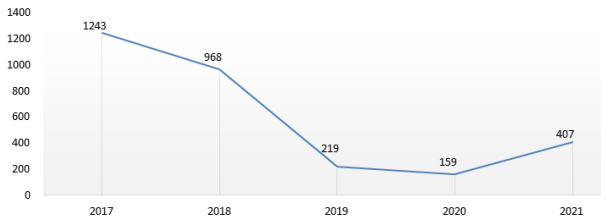

Figure No.2: PPD poisoning cases

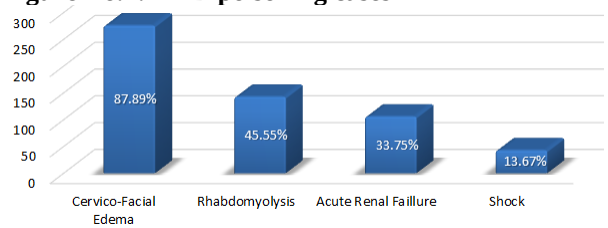

Figure No.3: Complications of PPD poisoning in critically ill patients

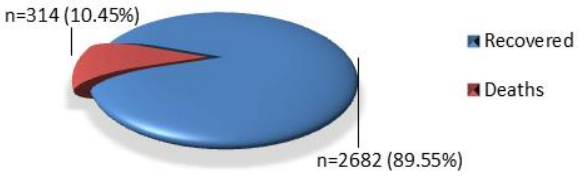

Figure No.4: Outcome of PPD poisoning

Fig-1 reflects a female predominance of 72% while Fig.2 shows record of cases from 2017 (n=1243) to 2021 (n=407). Fig-3 unveil major complications due to PPD poisoning including cervico-facial edema (87.89%), rhabdomyolysis (45.55%), acute renal failure (33.75%) and shock (13.67%). Fig-4 exhibit that most of the cases recovered n=2682 (89.55%), While 10.45% patients died n=314.

DISCUSSION

The mean age was 24.67 ± 7.32, while most commonly involved group for PPD poisoning in this study was 20-40 years of age, for both males and females (Table-1). This can be attributed to the fact that in this age bracket, one tries to look adorable while performing duties or attending rituals leading to increased risk of accidents. Moreover, people in these age group faces maximum hardships of life leading to psychological disturbances

and suicidal tendencies. These results are comparable with a study conducted at Sahiwal where Akbar et al noted mean age as 23.01 ± 7.24 with maximum number of cases below 31 years of age.[11]

Fig-1 depicts that there is a strong inclination of Kala Pathar (PPD) poisoning cases in females (72%) n=2166 in last five years at Bahawalpur, it is because of the fact that females are much more emotionally unstable as compared to males, leading to self-inflicted poisoning cases. Moreover, there is a natural instinct of females to look enchanting causing excessive use of hair dye and Hinna. These findings are consistent with other studies performed by Ansari et al and Akbar et al, placing female relative frequency at 82% and 78.8% respectively.[8,11]

Fig-2 reveals that there is a steep drop of cases of PPD poisoning is noted after 2018 in Bahawalpur district. One plausible explanation to this finding can be strict monitoring of over the counter sales of PPD by the retailers and secondly, a decline in poisoning induced suicidal attempts by the patients. Similar changing trends were noted by Arafat et al, observing that hanging is more common method of suicide with a growing penchant towards firearm inflicted suicidal attempts.[3] In year 2020, minimum number of cases n=159 reported in A&E department. This is a\ because of the fact that people experienced lock down almost throughout the year, with decreased availability of the poison. But once the markets were opened in 2021, a rise in PPD poisoning was again recorded n=407.

Fig-3 demonstrates that most common complication suffered by the critically ill patients of PPD poisoning is cervico-facial edema (87.89%), it is because of the fact that PPD acts as allergen both on body surface as well as on mucosal layers, leading to intense Type-1 hypersensitivity reaction, which in turn causes degranulation of mast cells and humoral response by Ig-E antibodies. Rhabdomyolysis is the second most common complication observed in these patients which is non-traumatic and non-exertional in nature.[9] Direct and Indirect tubular injury due to rhabdomyolysis leads to acute renal failure, making it third most common complication in critically ill patients. These findings are consistent with the observations noted by Akbar et al (78.4%) and Khan et al (94.7%).[10,12] As a result of these complications, 314 patients succumbed to death (10.45%) in last five years at tertiary care hospital of Bahawalpur (Fig-4). However, in other studies the mortality rate noted by the researchers were ranging from 38.6% to 50.5%. [8,11,13] The low mortality rate in present study can be envisaged due to early emergency medical care at B.V Hospital, which is present in the center of Bahawalpur city having radius of less than 15Km and secondly availability of allied sub-specialties to overcome complications associated with PPD poisoning.

CONCLUSION

To conclude, it is evident that the most commonly involved age group is 20-40 years with an overwhelming female predominance. Cervico-facial edema is most common complication and the mortality as a result of these complications is 10.45%.

Recommendations: Strict monitoring of PPD sales can curb poisoning due to PPD. Moreover, early intensive care with availability of sub-specialties can help reduce mortality rate due to Kala Pathar Poisoning.

Author's Contribution:

Concept & Design of Study:	Ayesha Muzzammil, Aslam Baig
Drafting:	Faisal Naeem Cheema, Ahmad Raza Khurram
Data Analysis:	Talha Naeem Cheema, Tehreem Abaid
Revisiting Critically:	Ayesha Muzzammil, Aslam Baig
Final Approval of version:	Ayesha Muzzammil, Aslam Baig

Conflict of Interest: The study has no conflict of interest to declare by any author.

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