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Research Article

**A CROSS SECTIONAL STUDY ON THE PATIENTS  
PRESENTING WITH PARAPHENYLENE DIAMINE  
POISONING: OUR EXPERIENCE AT MAYO HOSPITAL  
LAHORE**<sup>1</sup>Atta Ur Rehman, <sup>2</sup>Sobia Sadaf, <sup>3</sup>Dr. Hira Zahid<sup>1</sup>Allama Iqbal Medical College Lahore<sup>2</sup>Allama Iqbal Medical College Lahore<sup>3</sup>Mayo Hospital Lahore**Abstract:**

**Objective:** Research objective was to conduct a study of clinical, demographic features and findings of poisoning due to Paraphenylene Diamine (PPD) which local people know as "Kala Patthar". **Methodology:** Our research included the patients of PPD poisoning which the Intensive Care Unit of Mayo Hospital Lahore admitted from June-2015 to May-2018. In this research, we recorded clinical and demographic features as well as results of patients.

**Results:** Our research included the sample of total 16 patients who ingested PPD poison. Most of those patients were females of young age 21 to 30 years and belonged to the class of low status. Most of the time, their intention behind poison ingestion was suicide. We found out through clinical reports that the earliest symptoms appeared were throat pain, cervicofacial oedema, stridor, dysphonia and dysphagia. Hepatitis, rhabdomyolysis and ARF were found to be dominating the clinical findings when some time was passed after the poison ingestion. The therapeutic measures required for survival were active pharmacological intervention, ventilation through assistance and elective tracheostomy. In our research, we observed a high rate of mortality i.e. 37.5%.

**Conclusion:** After analyzing the findings of our research, we associated PPD poisoning with high mortality and morbidity.

**Keywords:** Therapeutic, Paraphenylene diamine poisoning; Liver Function Test (LFT), Tracheostomy

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**INTRODUCTION:**

Every year, around a million deaths occur worldwide due to rather a curable social issue, i.e. Suicide, whose rate has increased by sixty per centum since last five decades. Poison intake has been a major issue for Hospital emergencies. It is because of its preference in suicidal attempts. People of the developing nations use anti-pests (agricultural) whereas a high dose of sedatives, narcotics and hypnotics are mostly used by the people of the developed countries as the means of suicide. Recently, people from the different developing Asian and African countries have come to know the use of Paraphenylene Diamine, with the suicidal intentions, which has been found to be responsible for a large number of deaths. "Kala Pathar", which is crushed and added in henna to intensify its colour, contains PPD as an active content. Not only this but also people from our locale are using the same in hair colourants increasingly.

The oral intake of Paraphenylene diamine causes death within the initial six to twenty-four hours for it becomes the cause of angioneurotic oedema or cardiotoxicity, and leads to fatal arrhythmias. If the patient intakes the dye in small quantity or vomits most of it, it will resultantly cause angioneurotic oedema and hepatitis. ARF occurs in the first week of medium intake. PPD is treated casually and there is no antidote for this poison even after a high rate of mortality and repeated report of cases, PPD is handled casually and no antitoxin is there against its poison. The goal of this study was the documentation of clinical presentation, findings in laboratory and hair dye poisoning consequences at Intensive Care Unit of Mayo Hospital Lahore as well as to share our understandings about PPD.

**METHODOLOGY**

The research was carried out at the Intensive Care Unit of Mayo Hospital Lahore. The duration of the research was from June-2015 to May-2018. The test specimen consisted of sixteen patients who were hospitalized via medical departments and emergency in the ICU due to poisoning with hair colourants. The committee of ethics has granted permission for publication of research results. We used a proforma to gather the data from the subjects which consisted demographic features (sex, age, socio-economic status, marital status etc.), clinical features (especially urine color and cervicofacial edema), lab reports (functioning of liver test, complete blood-count, LDH, glucose, CK, creatinine, urea, ECG and electrolytes), intoxication mode (suicide or accidental) intoxication route (skin, gastrointestinal system).

We identified Paraphenylene diamine poisoning on the basis of the information which we collected from friends and family as well as on the clinical reports. Because of societal limitations, we could not conduct postmortem or screening of toxicology. The patients went through anti-histamines, gastric lavage, sodium bi-carbonate, parenteral steroids, saline and dextrose through Intra Venous. We used forced diuresis to supplement the removal of toxins through excretions of the kidney. Ten patients underwent the Tracheostomies because laryngeal oedema prevented intubation.

We started pressure-support mode (volume controlled or pressure controlled) and synchronized intermittent mandatory ventilation. Then applied the positive end-expiratory pressure as 5 centimetres (H<sub>2</sub>O) and kept the O<sub>2</sub> saturation above 94 % through titration. We conducted T-tube trials and pressure-support weaning for the purpose of weaning for mechanical ventilation. Similarly, we made a log of the rate of mortality, morbidity and hospitalization time. Then we directed the carried-out counselling on attendants and referred the recovered patients for the psychiatric assessment to the Department of Psychiatry. We used SPSS software (windows OS) in order to analyze the statistical data. Categorical data is laid down as number and percentages with respective Mean and SD values.

**RESULTS:**

Our research included the sample of total 16 patients who ingested PPD poison. Amongst them, female patients were in majority 87.5% (14) whereas male patients were 12.5% (2). The patients were major of ages between 21 to 30 years and their average age was  $25.87 \pm 5.59$  years. Three-quarters of the total patients ingested poison with suicidal intention. On the other hand, the remaining four patients did it accidentally. The findings confirmed Intoxication in eighty percent patients due to societal clashes. All of the subjects of our test belonged to rural areas. In 81.3% (13) of our patients, the intake of poison was oral, while in 3 of the cases via the transdermal route. Table 1 summarizes the demographic features.

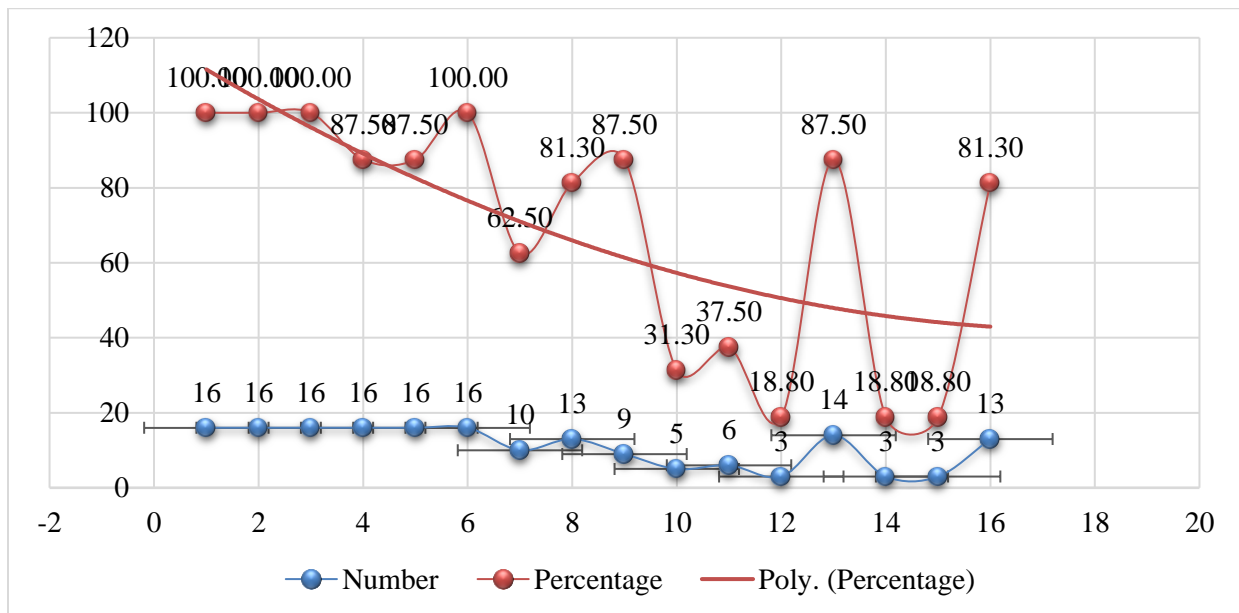
All of the patients had the symptoms of poisoning from hair dye (oral erythema, pain in throat, cervicofacial oedema, dysphonia and dysphagia). Around half of the patients (56.3%) showed the signs of rhabdomyolysis (muscle oedema, muscle tenderness/aches, urine of cola colour, myoglobinuria, raised creatinine phosphokinase). Sinus bradycardia, T-tenting and hemodynamic shock were detectable in 18.8 % whereas we found sinus tachycardia in 81 % of the patients. 37.5% of patients had ARF and five patients had

anuria/oliguria. We found stridor in half of the patients (Table 2). The research indicated the traditional features of poisoning like dark-coloured urine, hepatitis and cervicofacial oedema in the first 6-hours of ingestion of poison. The investigation with respect to laboratory shows that the mean Standard Deviation of SGPT, CPK and TLC was  $851.19 \pm 1604$ ,  $28.43 \pm 13.20$  and  $10375 \pm 4731.1$  respectively.

While the patients were staying in the hospital, all of them underwent hydrocortisone, 14 through an emergency tracheotomy, 12 were in the requirement of ventilator support for compromise of airway and ARF happened to 2 patients after three days. Six of the total patients expired. Their stay at ICU was 1 - 20 days (mean  $5.76 \pm 3.05$  days).

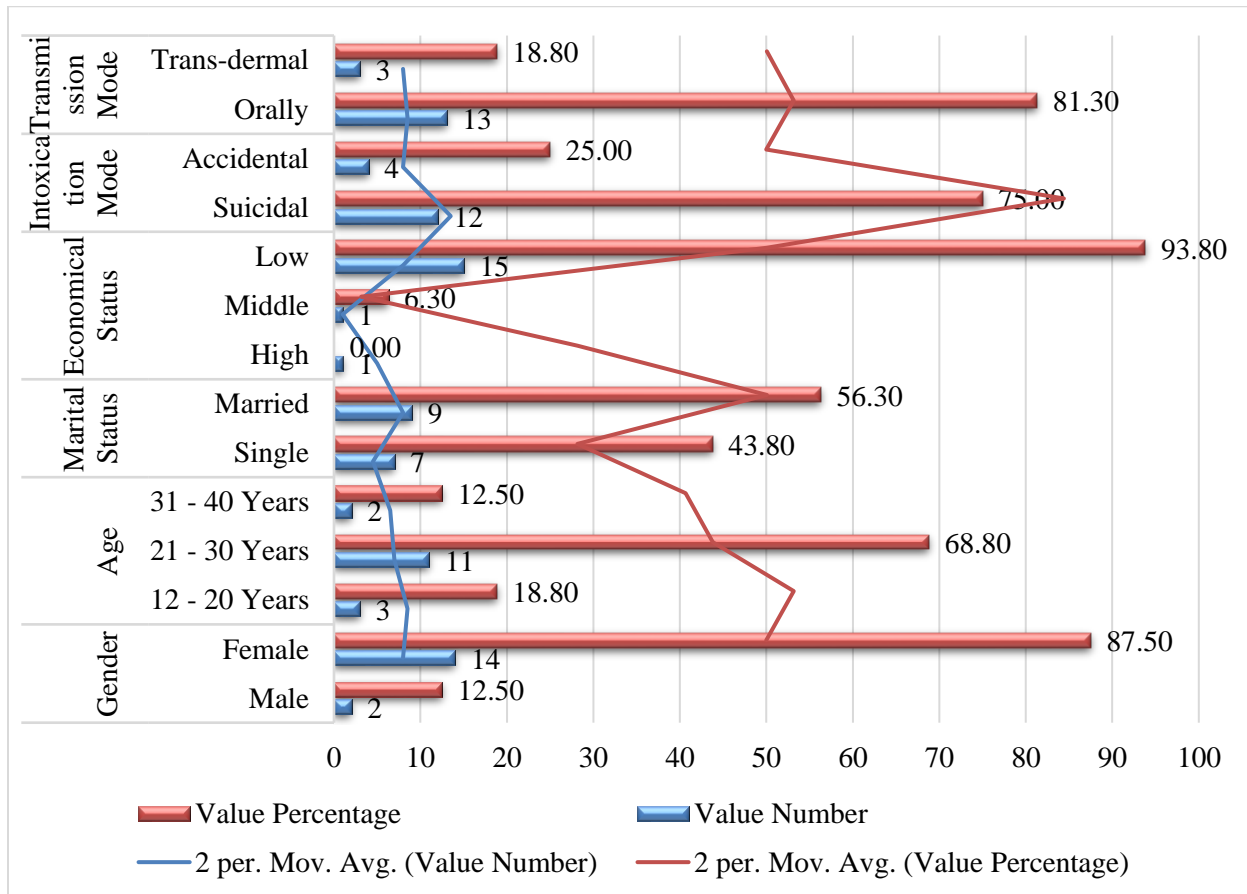
**Table – I: Clinical Features**

| Clinical Features              | Number | Percentage |
|--------------------------------|--------|------------|
| Pain in Throat                 | 16     | 100.00     |
| Oral Erythema                  | 16     | 100.00     |
| Cervicofacial Edema            | 16     | 100.00     |
| Dysphagia                      | 16     | 87.50      |
| Dysphonia                      | 16     | 87.50      |
| Difficulty in Opening of Mouth | 16     | 100.00     |
| Muscle Aches/Rigidity          | 10     | 62.50      |
| Dark urine                     | 13     | 81.30      |
| Rhabdomyolysis                 | 9      | 56.25      |
| Oliguria/Anuria                | 5      | 31.30      |
| Acute Renal Failure            | 6      | 37.50      |
| Hyperkalemia                   | 3      | 18.80      |
| Hepatitis                      | 14     | 87.50      |
| Hemodynamic shock              | 3      | 18.80      |
| Sinus bradycardia              | 3      | 18.80      |
| Sinus tachycardia              | 13     | 81.30      |



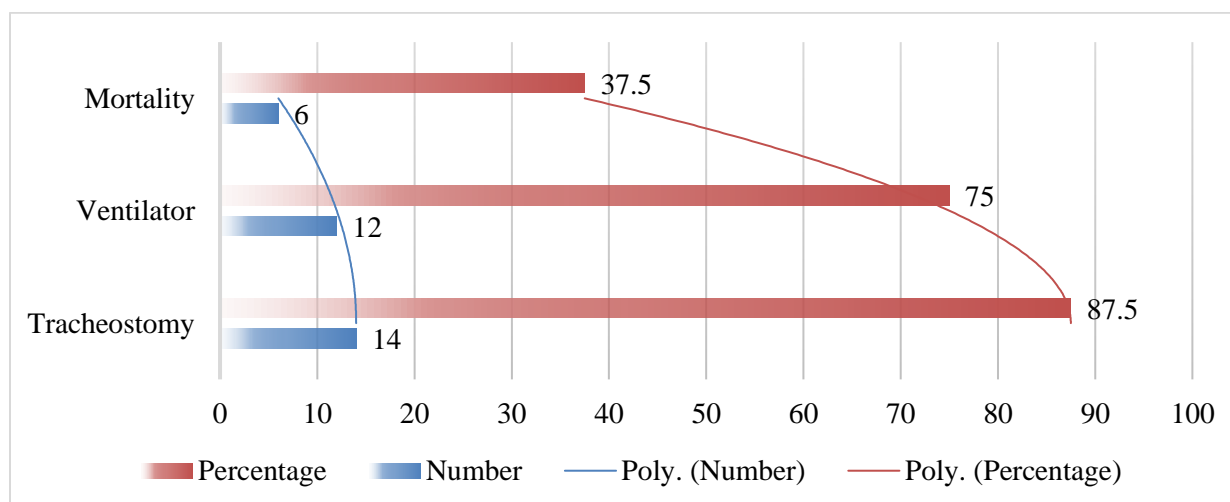
**Table – II:** Demographic Parameters

| Parameter         |               | Value            |            |
|-------------------|---------------|------------------|------------|
|                   |               | Number           | Percentage |
| Age               | Mean $\pm$ SD | 25.87 $\pm$ 5.59 |            |
| Gender            | Male          | 2                | 12.50      |
|                   | Female        | 14               | 87.50      |
| Age               | 12 - 20 Years | 3                | 18.80      |
|                   | 21 - 30 Years | 11               | 68.80      |
|                   | 31 - 40 Years | 2                | 12.50      |
| Marital Status    | Single        | 7                | 43.80      |
|                   | Married       | 9                | 56.30      |
| Economic Status   | High          | 1                | 0.00       |
|                   | Middle        | 1                | 6.30       |
|                   | Low           | 15               | 93.80      |
| Intoxication Mode | Suicidal      | 12               | 75.00      |
|                   | Accidental    | 4                | 25.00      |
| Transmission Mode | Orally        | 13               | 81.30      |
|                   | Trans-dermal  | 3                | 18.80      |



**Table – III:** Hospitalization Outcomes

| Outcomes        | Number    | Percentage |
|-----------------|-----------|------------|
| Tracheostomy    | 14        | 87.5       |
| Ventilator      | 12        | 75         |
| Mortality       | 6         | 37.5       |
| ICU stay (days) | 6.43±3.61 |            |

**Table – IV:** Laboratory Parameters

| Laboratory parameters | Unit                       | Mean   | ±SD    | Mode/Range | Range        |
|-----------------------|----------------------------|--------|--------|------------|--------------|
| TLC                   | 1000 cells/mm <sup>3</sup> | 10375  | 4731.1 | 6000       | 5000 - 20000 |
| CPK                   | U/L in 1000                | 28.43  | 13.2   | 24         | 01 to 60     |
| SGOT                  | U/L                        | 1365.2 | 1186.3 | 1500       | 119 - 5247   |
| SGPT                  | U/L                        | 851.19 | 1604   | 100        | 20 - 6550    |
| Serum creatinine      | mg/dL                      | 1.98   | 2.97   | 1          | .50 - 13     |

**DISCUSSION:**

As “Kala Patthar” is salty instead of bitter in taste and easily available at low cost in our locale, people are using it more and more with the suicidal intentions; resultantly, poisoning through Paraphenylene Diamine. “Kala Patthar” mainly contains 04% of PPD, propylene glycol, resorcinol, ethylenediaminetetraacetic acid (EDTA), liquid paraffin, sodium, cetostearyl alcohol, sodium lauryl sulphate, preservatives, perfumes and herbal extracts. Amongst these constituents, the toxicity of some with systematic effects is determined already, whereas the others are yet unknown of their toxic properties. The intake amount determines the effects of toxicity. The majority of the cases in our study were females of

relatively young age ( $25.87 \pm 5.59$  years), just as in many studies conducted previously. Akbar MA and Anugrah Chrispal *et al.* came out with the results which contained the similar age groups having a prevalence of female patients, 27.75 years and  $20.5 \pm 4.65$  years respectively. It might be that the poisoning in this age group is due to societal clashes. All the patients were from low-income families and lived in rural areas. Their intention of the PPD compound ingestion was to commit suicide in most of the cases i.e. 70 %.

Normally their motive behind ingestion is to force the members of their families to meet their demands. Within the first 4-6 hours of ingestion, poisoning’s classical feature occurred. This is the time period in

which maximum deaths occur; therefore, to reach an appropriate facility of health care in this time period is very important. Although the true reason is still unclear, Kallel et al. and Anurag Chrispal et al. observed in their research that the patients developed Cervicofacial oedema as the first symptom (79% and 69.2% respectively). The main risk is the failure of respiration; whereas most important steps of saving a life are tracheostomy, assisted ventilation and endotracheal intubation. In his study, the researcher observed that tracheostomy was present in his patients at 15.8% rate, a research at Lahore this rate as sixty percent; whereas, we diagnosed that this procedure was necessary for most of our patients (87.5%). These statistics need more elaboration; the sample size and the amount of toxic intake might be helpful in the explanation of variances. We found six of our patients in the state of Coma or unconsciousness which makes 37.5% of the total of subjects; therefore, this feature of poisoning by ingestion of Paraphenylenediamine is as much important. Akber and Kallel et. at found-out in their research that 26.3% and 20% cases (respectively) were either in Coma, or unconscious. The original cause might be Myocarditis, Hypovolemia and Sepsis. 12.5% of our patients indicated the symptom of hyperkalemia which is a predictive factor of deaths in patients of Paraphenylene diamine poisoning. A local research observed hyperkalemia in 26.3% of their patients whereas Kallel et al. noted this in twenty percent of his patients. It is probable that ARF and Rhabdomyolysis are the reasons for Hyperkalemia. Our research shows that out of the total of our patients, seventy-five percent of them had symptoms of rhabdomyolysis. Kallel et al also found this out in his research. 37.5% of our patients showed the evidence of ARF (40% by Akber et al and 47.4% by Kallel et al.). Our research also indicated that a considerable number of our patients indicated the evidence of hepatitis. This number reaches to forty percent in a local research and hundred percent in a research conducted internationally. Patients develop hepatitis even if they consume as little as 25 millilitres of paraphenylene diamine. A research conducted in Nellore, India concluded that morbidity increase, e.g. hospital stay duration, mortality and need of ventilator support depended upon the intake amount of PPD but as we lacked the resources, we could not make accurate readings of the amount of compound ingestion. We assumed dosage amount to be large as most of our patients expired.

The findings in our research indicated the rate of mortality to be 68.8% which is quite high when we compare it to other studies (four percent in India, twenty percent in Multan and twenty-one percent in a

research conducted by Benslama et al. Late identification of symptoms and patients arriving late in our hospital might be the cause of mortality rate. Therefore, recognizing and arriving early can save lives. There is no proper antidote for this poisoning; therefore, steps to manage to poison are antihistamines, gastric lavage, parental steroids and especially urine alkalinization and hydrocortisone. Patients may require ventilator support as one of the major early problems is Respiratory distress, in case of ARF; patients might be in need of dialysis for renal support, but our patients were unfit for it and died early. Due to this reason, we could not perform renal support.

### CONCLUSION:

PPD ingestion is becoming a substitute for organophosphorus poisoning for its bitterness, easy procurement and low cost. Therefore, it is becoming a threat to Asian countries. Our recommendations regarding this issue are that the government should restrict the sales of Kala Pathar and launch a program in order to raise awareness in public about this poison.

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