



## **Outcome of Deliberate Paraphenyline Di-Amine Ingestion among Young Women**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JPRI/2021/v33i60B34794

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/77105>

**Original Research Article**

**Received 09 December 2021**

**Accepted 23 December 2021**

**Published 23 December 2021**

## **ABSTRACT**

**Background:** Para phenylene diamine (PPD) or black stone, a common hair-dye ingredient in South Asia, has recently emerged as a new means of suicidal attempts in developing countries especially in Asia.

**Objective:** To determine the outcome of deliberate Para phenylene di-amine ingestion among young women.

**Methodology:** This descriptive analysis was conducted upon a sample of 400, young women (aged 18 to 35 years) presenting to the emergency department from June 2019 to December 2021, with deliberate Para phenylene di-amine ingestion. After taking written informed consent, the data was recorded onto a structured questionnaire containing inquiries pertaining to basic biodata, socioeconomic details, time elapsed since ingestion, clinical signs and symptoms and the outcome (within 24 hours).

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**Results:** The mean age of the sample stood at 23 (SD  $\pm$  2) years. Out of the total 400 cases of deliberate ingestion reporting to the study setting, 19 were asymptomatic and were discharged after initial care. Among the symptomatic patients, 212 (53%) recovered within 12 hours without need for intensive care, while 139 (34.75%) needed admission to intensive care unit, following which a full recovery was achieved within 24 hours (98 patients) or more (31 patients), while the remaining 10 patients succumbed to the poisoning. 30 patients reached the hospital in critical state and died in the emergency department.

**Conclusions:** The cumulative mortality rate recorded in the research was 10%. Factors such as time between ingestion and presentation to the hospital, the quantity of ingestion and the general health status, affected the outcome of the patient.

*Keywords: Poisoning; para phenylene di amine; attempted suicide; hair dye and toxicity.*

## 1. INTRODUCTION

In recent times, the incidence of deliberate self-harm and suicide has witnessed a steep rise of epidemic proportions across the world. Data from the World Health Organization (WHO) revealed that over 0.87 million suicides took place globally, with many more cases of deliberate self-harm being reported: adding to the already high rates of premature mortality [1]. Among the many methods employed to inflict deliberate self-harm or committing suicide, poisoning remains the commonest, especially in the Asian countries [1].

The region faces marked socioeconomic, disparity and low standards of living, [2, 3] serving as a catalyst for poor mental health and explaining the reports claiming an incidence of over 0.5 million suicidal cases per year. It is interesting to note that deliberate ingestion of poisons and toxic agents readily available at home (pesticides and hair dyes) serve as the means for 0.3 million of the cases [4, 5].

Moreover, recent reports suggest that poisonous agents readily available at home such as pesticides and hair dyes are at present, the commonest means of committing suicide globally. [6] Nonetheless, a major proportion of the usage stems from the developing world, and in comparison, the agents of choice in the developed world use other pharmacological agents such as insulin and paracetamol [7]. The cumulative case fatality (attributed to poisoning) is recorded to be as high as 20%, [8] and thus, are responsible for steep rise in the premature mortality rates worldwide and most notably the rural areas of the developing world [9]. Para phenylene diamine (PPD) or black stone, a common hair-dye ingredient in South Asia, has recently emerged as a new means of suicidal attempts in developing countries especially in Asia and Africa. The agent is a good hydrogen donor and metabolized by electron oxidation to

an active radical by cytochrome P450 peroxidase to form a reactive compound called benzoquinone diamine and later into Brandowaski's base. PPD accelerates the dyeing process. Ingestion of PPD causes rapid development of edema of the face, neck, pharynx, tongue and larynx initially and rhabdomyolysis later. Finally, an acute renal failure supervenes as renal tubular necrosis occurs due the deposits of the toxic metabolites of PPD [10, 11].

Females dominate the demography of culprits committing the misuse of PPD, particularly the young-aged group (15-35 years) [4]. Many vulnerable groups are identified, to be responsible for the steep rise in the deliberate self-harm and poisoning cases in the developing world; chief among which are young-age, female gender, married individuals, low socioeconomic class, unemployed individuals, and mentally distressed individuals. This coupled with the ease of access to the deleterious agents is a deadly problem [12,13].

The rates of self-harm rates peak in the population of 15–24-year-olds and are generally highest among women due to the tendency of young people, particularly females, to engage in impulsive acts of self-harm [4]. It has been reported that deliberate poison ingestion is a common method of self-poisoning and suicide and research from Pakistan has noted the usage of Para phenylene diamine among other agents. [14,15].

## 2. MATERIALS AND METHODS

This descriptive analysis was conducted upon a sample of 400, young women (aged 18 to 35 years) presenting to the emergency department from June 2019 to December 2021, with deliberate para phenylene di-amine ingestion. After taking written informed consent, the data was recorded onto a structured questionnaire

containing inquiries pertaining to basic biodata, socioeconomic details, time elapsed since ingestion, clinical signs and symptoms and the outcome (within 24 hours). These patients were initially admitted to the emergency department and were then, shifted to the department of Medicine for management. In-case the patient was unconscious or not in a state to give consent, due consent was sought from immediate relative / guardian / care provider.

### 3. RESULTS

The mean age of the sample stood at 23 (SD ± 2) years.

**Table 1. Age distribution of the participants**

Age Group	Frequency	Percentage
Up to 20	28	7%
21 – 25	292	73%
26 – 30	47	11.75%
31 – 35	33	8.25%

Out of the total 400 cases of deliberate ingestion reporting to the study setting, 19 were asymptomatic and were discharged after initial care. Among the symptomatic patients, 212 (53%) recovered within 12 hours without need for intensive care, while 139 (34.75%) needed admission to intensive care unit, following which a full recovery was achieved within 24 hours (98 patients) or more (31 patients), while the remaining 10 patients succumbed to the poisoning. 30 patients reached the hospital in

critical state and died in the emergency department.

### 4. DISCUSSION

Access to poisons is effectively being limited worldwide. Governmental laws and regulations by drug agencies have made most pharmacologic agents (with possible lethal affects associated with overdose) in-accessible. Individuals looking to afflict self-harm have thus resorted to newer more accessible agents; one among which is Para phenylene diamine [4,15].

Para phenylene diamine (PPD) is a common ingredient in many hair-dyes used in the Indian sub- continent and parts of Africa [10,11]. Since females Females dominate the demography of culprits committing the misuse of PPD (in the range of 56% to 85% specifically in young population), particularly the young-aged group (15-35 years) [16-19]. Many vulnerable groups are identified, to be responsible for the step rise in the deliberate self-harm and poisoning cases in the developing world; chief among which are young-age, female gender, married individuals, low socioeconomic class, unemployed individuals, and mentally distressed individuals. [12,13].

In this research, the mean age of the study sample was 23 years and falls well-within the age brackets reported to be common victims by published evidence (in the range of 24.7 to 27.7 years) [20,21]. Studies report that PPD misuse and incumbent poisoning is specifically observed

**Table 1A. Outcome measures**

		Outcome	
Cured		Expired	
Without Need for ICU	With Need for ICU	Despite ICU Admission	Expired Before Intervention
231	129	32	08

**Table 2. Factors affecting survival**

Variable		Cured	Expired	P value
Age	Up to 20	26	02	0.032
	21 – 25	256	36	0.177
	26 – 30	46	01	0.112
	31 – 35	32	01	0.129
Time Elapsed Since Ingestion	Less than 4 hours	208	07 (3.4%)	0.127
	More than 4 hours	152	33 (21.7%)	0.046
Hospital Stay	Up to 24 hours	236	30	0.110
	More than 24 hours	124	10	0.0493

in the younger age (15 to 24 years) [4,15]. This preponderance of young females inclined to self-poisoning warrants an immediate public health attention for the stakeholders and policy makers.

Although the present study extends the previous work on poisoning cases in Pakistan; namely the fact this was a single center study and in future more centers may be involved, and a wider sample size be researched.

## 5. CONCLUSIONS

The cumulative mortality rate recorded in the research was 10%. Factors such as time between ingestion and presentation to the hospital, the quantity of ingestion and the general health status, affected the outcome of the patient.

## DECLARATION

All the authors have contributed in the research and fulfil the ICMJE authorship criteria.

## ETHICAL APPROVAL

The study was conducted after due approval from the institutional ethical committee.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

## FUNDING DISCLOSURE

No external funding was sought or procured. The principal investigator dealt with all the relevant expenses incurred because of the research process.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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