



PARAPHYLENE DIAMINE/KALA PATHAR POISONING; TO STUDY THE DEMOGRAPHIC PROFILE, CLINICAL MANIFESTATIONS AND OUTCOME OF PARAPHYLENE DIAMINE/KALA PATHAR POISONING AT SHEIKH ZAYED HOSPITAL RAHIM YAR KHAN.

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ABSTRACT... Objectives: To study the baseline characteristics, clinical presentation and consequences of paraphenylene diamine (PPD) commonly known as Kala Pathar poisoning. **Study Design:** Cross sectional study. **Setting:** Medicine Department of Sheikh Zayed Medical College/Hospital Rahim Yar Khan. **Methodology:** A total of 42 patients with PPD poisoning were admitted in medical ward no 1 over a period of one year from January 2016 to December 2016. These patients were assessed in terms of baseline characteristics, clinical presentation and consequences of PPD poisoning by using SPSS 16. **Results:** There were 13 (31.0%) male with mean age 25.87 ± 5.59 , 28 (66.7%) female with mean age 21 ± 7 and 1 (2.4%) shemale. Majority of them were unmarried 32 (76.19%), belonged to rural area 36 (85.7%) with low socio economic status 32 (76.19%) and purpose of poisoning was suicidal (95%) with p-value less than 0.001. More than 90% patients had social conflict in family. More than 90% patients presented with neck & face edema, pain in throat, muscle aches & pain, difficulty in swallowing and speaking as an earliest clinical findings. Regarding complication of PPD poisoning 47.61% patients developed Rhabdomyolysis, 39.09% hyperkalemia, 37.5% acute renal failure and 90% patients had hepatic damage in the form of elevated SGPT. A total of 66.6% patients were discharged while mortality was observed in 33.3% patients in spite of that 76.1% patient underwent tracheostomy and 33.3% assisted ventilation. Female gender, time delay, acute hepatic and renal failures were independent predictor of mortality after PPD poisoning. **Conclusion:** Paraphenylene diamine (PPD) poisoning was associated with high mortality rate. There is urgent need to give public awareness to people about this deadly poison. Moreover government should take initiative to restrict PPD use and provide some cheap alternative in order to reduce its incidences.

Key words: Paraphenylene Diamine Poisoning, Hepatitis, Renal Failure, Suicide, Tracheostomy.

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INTRODUCTION

Suicide is one of the major health issues all across globe as significant number of patients died annually. According to WHO, there is one death by suicide every 20 seconds and one attempts every 1-2 seconds. This number will increase to approximately 1.53 million deaths by 2020. Moreover numbers of suicide attempts will be 10-20 times more worldwide. Sociodemographic, psychiatric and psychological factors plays a dominant role in the etiology of suicide.¹ In addition there are number of suicidal related medical ailments such as chronic diseases, cancers, AIDS, liver and renal failure that indulge

people in practice of suicide. The trends of suicide has been shifted from Western Europe to Eastern Europe and now to Asia due to various reasons.²⁻³

Poisoning is one of the most common and preferred methods of suicide. Both male and female commits suicide. However in comparison with female, males usually complete suicide successfully with fewer attempts because of their aggressive and violent methods.⁴ However mode of poisoning quite varies among countries. In developed countries the mode of poisoning are usually drugs in the form of opioids analgesics,

paracetamol, anxiolytics and antidepressant. On the other hand organophosphorus compounds that are used in pesticides are one of the most common suicides poisoning in developing countries. This will add significant mortality and morbidity in developing countries and pose a social as well as economic burden on health system.⁵

In recent years a new chemical called Paraphenylene Diamine (PPD) commonly known as Kala Pathar used extensively in many developing countries of world as a mode of suicide poisoning. It is one of the preferred agents for suicide by most people because of its high mortality rate. Moreover it is easily available in the market because of its low price and cosmetic use. Women usually dye their hairs by making mixture of PPD with other agents. Patients usually take it orally and death usually occurs within hours mainly due to laryngeal edema, rhabdomyolysis and acute renal failure.^{6,7}

PPD poisoning has early as well as late clinical sequelae. The early clinical manifestation mostly compromised of angioneurotic edema, laryngospasm, cardiotoxicity and acute pulmonary edema. On the other hand hepatic damage and renal failure are late findings observed in PPD poisoning.⁸ However acute and late clinical manifestations depends upon number of factors such as amount of PPD ingestion, time period of ingestion, time taken to hospital emergency and other timely measures such as gastric lavage, endotracheal intubation and tracheostomy. The cases of PPD poisoning manage symptomatically as no specific antidote is available. The main aim in the management of PPD poisoning is to treat early manifestation and to prevent late complications.^{9,10}

The main aim of our study was to identify baseline demographic characteristics, laboratory parameters, clinical features and outcomes of PPD poisoning in one of the teaching of southern Punjab.

Inclusion Criteria

The following were inclusion criteria;

1. Patients with kala pathar poisoning.
2. Age between 12 to 60 years.
3. All sexes including male, female and shemale.
4. Patients and relatives willing for participation in the study.

Exclusion Criteria

The following patients were excluded from the study;

1. Patient/Relative not willing to be included in the study.
2. Known case of any cardiac, respiratory, renal, liver or muscular disease based on history and examination.

METHODOLOGY

This cross sectional study was conducted in medical ward unit 1 of medicine department of Sheikh Zayed medical college/hospital Rahim Yar Khan. It is one of the tertiary care hospitals of Southern Punjab. The duration of study was one year, January 2016 to December 2016. During this time period a total of 42 patients with PPD poisoning were admitted in medical ward. These patients were admitted through emergency. The informed consent was taken from patients relative and ethical committee permission was got from institutional boarded review before start of the study.

The information about demographic characteristics, time period, clinical symptoms were collected from patients attendants (friends and family members). The diagnosis of PPD poisoning were made by clinical findings and history from patients itself as well as from attendants and relatives. The data about baseline demographic characteristics, clinical presentation (signs & symptoms), complications, laboratory parameters, ECG and final outcome of PPD poisoning were entered in computerized generated proforma. Patients were classified into low, middle and upper socioeconomic class according to their monthly income. Low socio economic class (monthly income < 20,000 rupees), middle socio economic class (monthly income >20,000 rupees) and upper socio economic class (monthly income >10, 0000 rupees) .Once patients were admitted they were

treated aggressively. After giving basic life support in emergency, gastric lavage was performed in order to remove unabsorbed poison. Intravenous fluids, corticosteroids, antihistamines, sodium bicarbonate and forced diuresis were also given to these patients. 32 patients had difficulty in breathing, so tracheostomies were performed in them. Psychiatric evaluation and counseling about prognosis of poisoning were clearly explained to patient’s attendants. Blood sample was taken to analyze Hb, TLC, serum SGPT, Serum creatinine and serum creatinine phosphokinase through chemistry analyzer.

Statistical Analysis

Data was presented as mean ± standard deviation for categorical variables and numbers/ percentages for continuous variables. SPSS 16 was used to analyze the data. The predictor of mortality after PPD poisoning was determined by univariate analysis by calculating odd ratio. A p-value < 0.01 were considered to be statistically significant.

RESULTS

The baseline demographic characteristics in terms of age, sex, mode of poisoning, marital, residential and socio economic status has shown in Table-I. There were 13 (31.0%) % male with mean age 25.87±5.59, 28(66.7%) female with mean age 21±7 and 1(2.4%) shemale. Majority of them were unmarried 32(76.19%), belonged from rural area 36 (85.7%) with low socio economic status 32(76.19%) and purpose of poisoning was suicidal (95%) with p-value less than 0.001. More than 90% patients had social conflict in family. Regarding clinical presentation, more than 90% patients presented with neck & face edema, pain in throat, aches & pain, difficulty in swallowing and speaking as an earliest clinical findings. These results have shown in Table-II. Regarding complication of PPD poisoning 47.61% patients developed Rhabdomyolysis, 39.09% hyperkalemia, 37.5% acute renal failure and 90% patients had hepatic damage in the form of elevated SGPT Table-III. Laboratory parameters were given in Table-IV. A total of 66.6% patients were discharged while mortality was observed in 33.3% patients in spite

of that 76.1% patient underwent tracheostomy and 33.3% assisted ventilation Table-IV. In order to identify independent predictor of mortality after PPD poisoning univariate analysis was done. Female gender, time delay, acute hepatic and renal failures were independent predictor of mortality after PPD poisoning (Table-V).

Parameters		Values	p-value
Age	Male	25.87±5.59	<0.01
	Female	21±7.2	
Gender	Male	13(31.0)	<0.01
	Female	28(66.7%)	
	Shemale	1(2.4%)	
Mode of Poisoning	Suicidal	40(95.23%)	<0.01
	Accidental	1(2.38%)	
	Homicidal	1(2.38%)	
Marital Status	Married	10(23.80%)	<0.01
	Unmarried	32(76.19%)	
Residential Status	Rural	36(85.7%)	<0.01
	Urban	6(14.28%)	
Socio-economic Status	Upper class	2(4.76%)	<0.01
	Middle class	8(19.04%)	
	Lower Class	32(76.19%)	
Time Delay	Urban	1.92± 1.32	<0.01
	Rural	12.23± 6.23	

Table-I. Baseline demographic characteristics

Clinical Presentation	N (%)
Throat discomfort/pain	40 (95.23)
Mouth redness/Oral Erythema	40 (95.23)
Stridor	24 (57.14)
Cervicofacial Edema	40 (95.23)
Difficulty in swallowing	40 (95.23)
Difficulty in speaking	40 (95.23)
Difficulty in Opening of Mouth	40 (95.23)
Muscle pain with rigidity	42(100%)
Dark color urine	20(47.61)

Table-II. Clinical presentation of PPD poisoning

Complications	N (%)
Rhabdomyolysis	20(47.61)
Hyperkalemia	16(38.9%)
Hepatitis	38(97.4%)
Acute Renal Failure	18(42.85%)
Therapeutic Intervention	
Tracheostomy	32(76.19%)
Ventilator	14(33.33%)
Final Outcome	
Survival Rate	28(66.66%)
Mortality Rate	14(33.33%)

Table-III. Complications, therapeutic intervention and final outcome of PPD poisoning

Hb	12.8± 4.43
TLC (1000 cells/mm ³)	11220± 6623
Serum SGPT (Units/L)	1293± 430.65
Serum Creatinine (Units/L)	3.12± 1.6
Serum CPK (Units/L)	83.23± 30.56

Table-IV. Laboratory parameters of PPD poisoning

Major Risk Factors	Odds ratio	CI (95%)	P-value
Female Gender	18.43	2.32-122.28	0.003
Time Delay	16.42	2.42-99.52	0.013
Acute Renal Failure	19.02	2.87-110.54	0.002
Acute Hepatic Failure	28.40	2.30-298.45	0.023

Table-V. Major risk factor of mortality (Univariate Analysis)

DISCUSSION

PPD is mostly used as a hair dying agent in rural areas of the developing world. It is one of the color enhancing agents used for cosmetic purposes. In order to reduce its number of skin application, it usually mixes with henna. It has local as well as systemic effects. PPD is one of the preferable agents for suicide poisoning because of its free availability and cost effectiveness. PPD is very toxic compounds as it contains a number of toxins that are mutagenic, carcinogenic and allergenic that causes inflammatory and oxidative cellular damage. PPD toxicity is one of the life threatening emergencies as it involves multiple systems in body.¹¹

In our study most of the patients were young

female. The reason behind poison intake was domestic issues and purpose was suicide intension in majority of the cases. All patients belonged to rural areas with low socioeconomic background. Majority of them were female and unmarried. These results were in consistent with both national as well as international studies which were mostly conducted in Asian and African countries. A studies conducted by Khuhro et al¹² peoples Medical College Hospital, Nawabshah, Akber et al¹³ at Nishtar hospital Multan, Qasim et al¹⁴ Bahawl at Victoria hospital Bahawalpur and Khan et al¹⁵ at DHQ Teaching Hospital, D. I. Khan yield similar results. A study conducted by Nautiyal¹⁶ and Perumal et al¹⁷ in India, Mohamed et al¹⁸ in Egypt, Elgamel and Ahmed¹⁹ in Sudan also showed same results. Although about 2/3 of the patients were female in our and above mentioned studies. However study conducted by Shalaby et al²⁰ in Egypt revealed similar results but male were predominant in comparison with female in a ratio of 18:7. In comparison to above mentioned studies there was no shemale while in our study there was one case of shemale. Easily availability of hair dye, gender discrimination and social pressure of society could be the predominance of PPD poisoning in females.

A time period is very important regarding PPD poisoning management. It is crucial to reach as early as possible in order to prevent its disastrous complications. In our study more than 90 % of patients developed pain in throat, difficulty in speaking, difficulty in swallowing, muscle pain, cervicofacial edema, oral swelling and hepatitis. However these clinical findings may vary from 60 to 100% in various national and international studies. In our study 47.61% patients developed Rhabdomyolysis, 39.09% hyperkalemia, 37.5% acute renal failure and 90% patients had hepatic damage in the form of elevated SGPT. The incidences of complication of PPD were also varying in various national and international studies. Acute renal failure, hyperkalemia and hepatitis also showed quite variation from 18% to 63% in national¹²⁻²⁰ and from 13% to 90% in international studies.²¹⁻²⁴ The reason behind that most of the patients were not reached in emergency with in 8 hour after PPD ingestion as

most of them belong to rural areas in our study. Moreover amount of PPD ingested, age of the patient, immune status and concurrent other illnesses are other factors that causes variation in clinical symptoms and complications associated with PPD.

Mortality rate was 33.3% in our study in spite of that 76.1% patient underwent tracheostomy and 33.3% assisted ventilation. A study conducted on 1258 cases of PPD poisoning in southern Punjab of Pakistan by Khan et al²⁵ showed 24.08% mortality rate, in which 98.1% patient underwent tracheostomy which was quite higher than our study but was associated with low mortality rate in comparison with our study. Two studies showed a bit high mortality rate than our study, 37.5% by Khuhro et al¹⁰ and 47.4% by Akbar et al.¹¹ On the other hand tracheostomy was done 87.5% and 60% patients in these studies respectively. The main reason of increase mortality in these studies was mainly due to time delay. However international studies also showed variation in mortality rate from 3.5% to 42%.²⁶⁻²⁹ Most of the patients with decrease mortality rate were immediately rushed to hospitals and were timely managed.

The systematic review of 32 studies and meta analysis of 29 studies in developing countries of Africa and Asia³⁰ showed a clear evidence that most of the patients of PPD poisoning were young female (73%) with suicidal intention 85-90%, angio neurotic edema was 67.1% and tracheostomy intervention was done in 47.9% patients. Acute renal failure was noticed in 54.7% patients. African showed a little bit high mortality 15.1% rates in comparison with Asians 14.3%. Our findings were almost similar to these meta analysis and systematic review but was associated with high mortality rate.

CONCLUSION

Paraphenylene diamine (PPD) poisoning is a new emerging threat in developing countries like Pakistan with high morbidity as well as mortality rate. There is urgent need to give awareness to people about this deadly poison. Moreover strict restriction about its use and some non toxic cheap

alternative of PPD should also be considered in mind in order to reduce its incidence.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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1	Javed Iqbal	Conceived the idea, Manuscript review and statistical analysis.	
2	Mazhar Hussain	Designed the study, preparing the manuscript and data analysis.	
3	Abid Hussain	Search the literature, collected the clinical data, manuscript editing and drafting fo the manuscript.	
4	M. Bilal Ghafoor	Final editing, plagiarism and drafting of manuscript.	