

## A Study of Paraquat Poisoning



### Medical Science

**KEYWORDS :** Paraquat Poisoning, Complications & Outcome.

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### ABSTRACT

*Paraquat is highly toxic for human and most animals. Ingestion of paraquat is the most common route of poisoning, however poisoning through other routes including dermal contact inhalation or injection have also been reported.*

*The present observational descriptive study was undertaken in a tertiary care hospital to study some important clinic-epidemiological features of this important poisoning. In our 100 cases of study, most common age group associated with PQ poisoning was between 21-30 years of age, 64% were males and 36% were females. Most common complication was ARDS(67%) followed by Multi Organ failure (58%), ARF (54%) and hepatitis (48%). 27% of the patients in the study improved and got discharge without complication, 9% were discharged against medical advice and 64% were expired.*

### Introduction:

A paraquat is a broad spectrum liquid herbicide used frequently in sugarcane farms of Western Maharashtra. Paraquat is associated with both accidental and intentional poisoning leading to severe and often fatal toxicity.

Paraquat poisoning has been reported from various parts of India ranging from the northern States to the southern States and northeast States<sup>1-11</sup>

Diagnosis is often difficult in absence of proper history nonspecific clinical features and lack of diagnostic tests.

Paraquat is a quaternary nitrogen herbicide that is sprayed on unwanted weeds and other vegetations before planting crops.

Farming is a one of the major occupation in Western Maharashtra, Kolhapur. Suicidal attempts using paraquat are quiet common, especially in young farmers, the outcome usually is grave. Today, it is the world's second largest selling weed-killer in over 100 countries.

Paraquat is highly toxic for human and most animals. Ingestion of paraquat is the most common route of poisoning, however poisoning through other routes including dermal of mucus contact inhalation or injection have also been reported.

The present study was undertaken to study some important clinic-epidemiological features of this important poisoning.

### OBJECTIVES

- To study the clinical profile of PQ Poisoning patients.
- To assess the effects of various factors on outcome PQ Poisoning.
- To assess the complications of PQ Poisoning.
- To assess the outcome of patient

Sandhu JS, Dhiman A, Mahajan R, Sandhu P<sup>6</sup> Studied outcome of paraquat poisoning a five year study. This study includes 17 patients of paraquats poisoning over 5 years period. Thirteen patients (76.5%) developed acute renal failure. Eight patients needed dialysis (5 received HD and 3 CVVHD). Respiratory failure (53%), digestive tract lesions (53%), hepatic involvement (47%), multi organ failure (47%) and circulatory failure (30%) were the other morbid events. The overall mortality was 35%. Late referral, multi organ failure, respiratory failure and circulatory failure were correlated to the mortality.

Mohammad Delirrad, Mohammad Majidi, Behzad Boushehri<sup>12</sup> conducted study aimed to evaluate the data on cases of acute paraquat poisoning and to compare different variables between survivors and non-survivors.

Jonq-Tzong Tai, GR Letchuman Ramanathan, Mun-Pung Choy, Leela Raman, Boon- Kok Lim<sup>13</sup> conducted a retrospective study describing the demographic characteristics, clinical features and outcome of paraquat poisoning cases admitted to Hospital Taiping from 1 st January 2008 to 30 th October 2011. Medical records of 79 patients were reviewed.

### Conclusion

The non-survivor characteristics of patients with paraquat poisoning are intentional exposure, delay from exposure to hospital admission, urine paraquat positivity and manifestation of respiratory failure.

### MATERIALS AND METHODS

**Study setting:** A tertiary care medical college hospital in Kolhapur district of Maharashtra.

**Study Population:** 100 Cases of PQ poisoning patients admitted in the hospital in Kolhapur.

**Study Design:** Descriptive observational Study.

### Sample size with justification:

100 Cases of PQ poisoning patients admitted in the tertiary care institution in Kolhapur where on an average 5-6 cases of PQ poisoning in patients are admitted per month. Time frame for this study was 18 months i.e. Sep 2013 to Feb 2015.

The sampling method resorted for the present study was non random purposive sampling technique. All cases of PQ poisoning reporting in the hospital during the study period and fulfilling the inclusion criteria were included in the analysis. Thus a total of 100 cases were studied & the findings of the same are presented in the study.

**Time Frame To address The study:** Sep. 2013 to Feb. 2015 (18 months)

### Inclusion Criteria

1. Patient age more than 12 yrs.
2. Patients with H/O consumption of paraquat either alone or with alcohol, organ phosphorous or other poisons.
3. Patients consenting to participate in the present study.

**Exclusion Criteria**

The following patients were excluded from the study.

Patients / relatives unwilling to participate or furnish history of present illness were excluded from the study.

**Methodology**

Study protocol was approved from Institutional Ethical & Research committee and clearance was taken. This is a descriptive study , where 100 patients of PQ Poisoning admitted to a tertiary Care Hospital were included according to the inclusion criteria & a written informed consent was taken from all patients. A standardized Study proforma ( Annexure 2 ) for data collection was designed and accordingly detailed history was taken from patients or their relatives, time of poisoning, and the volume of poison consumed were also recorded & clinical examination was done in each patient.

Patients were studied with due importance given to demographic features, symptomatology & clinical presentation, investigations , management, treatment outcome & complications. The clinical details were entered into the study proforma by maintaining the confidentiality of the patients information.

Immediately after admission, gastric lavage was done using fullers earth which was given as an adsorbent to all patients. Adequate hydration was ensured by I.V fluids. We have considered the patients for charcoal dialysis those who presented within 8 hours after ingestion of PQ poisoning. To prevent free radical injury and lung fibrosis, steroids therapy (intravenous dexamethasone 8 mg A6-8 hours until clinical improvement + infusion of methylprednisolone 500 mg in 6 hours for 3 days) 400 mg BD) and antioxidants ( vitamin C 500mg BD and vitamin E) were given to all patients. Supplemental oxygen was administered only when arterial oxygen tension decreased to <50 mmHg and / or the patients had symptoms of respiratory failure, ( Respiratory failure was diagnosed if mechanical ventilation was used to treat hypoxia not corrected by supplemental oxygen delivered by nasal canula or facemask),. Dialysis support was given only if indicated for acute renal failure i.e. symptomatic uremia ( serum creatinine< 5 mg/ dL) and acidosis, hyperkalemia or volume overload. ( Acute renal failure was defined by serum creatinine <2.0 mg/dl).

The main limitation of our study was the inability to test the level of serum or urine paraquat.

**Statistical Analysis:**

Data was entered in Micro soft excel 2007 and analysed using descriptive statistics, in the form of frequency, charts and percentage with the help of SPSS version 20.0.

**Tools:**

Clinical study proforma.

**OBSERVATIONS**

**Table - 1 Important Socio demographic determinants of cases**

Indicator	Number (n=100)	Percentage
<b>Age (years)</b>		
14-20 yrs	17	17.00 %
21-30 yrs	44	44.00 %
31-40 yrs	12	12.00 %
41-50 yrs	18	18.00 %
>50 yrs	09	09.00 %
<b>Sex</b>		
Male	64	64.00 %
Female	36	36.00 %
<b>Amt. of paraquat ingested</b>		
<10	13	13.00 %
10 - 20	19	19.00 %

>20	68	68.00%
<b>Duration in hours</b>		
< 8 hrs	41	41.00 %
8 – 24 hrs	34	34.00 %
>24 hrs	25	25.00 %
<b>Intention of Poisoning</b>		
Accidental	5	5.00 %
Suicidal	95	95.00 %

**Table – 2 PRESENTING SYMPTOMS**

SYMPTOMS	NO. OF CASES	%
Vomiting	76	76
Burns in throat	70	70
Abdominal pain	40	40
Difficulty in breathing	50	50

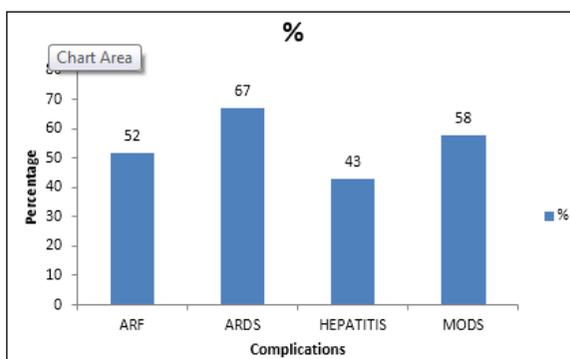
**Table – 3 COMPLICATIONS**

COMPLICATIONS	NO. OF CASES	%
ARF	52	52
ARDS	67	67
HEPATITIS	43	43
MODS	58	58

**Table – 4 OUTCOME**

PROGNOSIS	NO. OF CASES	%
Recovered	27	27
DAMA	9	9
Expired	64	64

**Graph - 1**



**DISCUSSION**

**AGE DISTRIBUTION (Table 1)**

In our 100 cases of study, most common age group associated with PQ poisoning was between 21-30 years of age, 44 cases out of 100 (44%). 18 % cases were in the age group 41-50 years followed by 17 % cases in 14-20 years age group. Remaining 12 % cases belonged to age group 31 to 40 years.

Mean age in our study was 36.07 years. In our study age ranged from 14-18 years. It is comparable with previous studies done in the past. In a study conducted by Mohammad Derriland most common age group was 21 to 30 years old. (46.3%) Median age was 25 years and age ranged 16 to 75 years.

In study conducted by Fazel Goudarzi most common age group was 20 to 30 years old. Mean age was 28.2 and age ranged 15 to 60 yrs.

In study conducted by Jenq Tan most common age group was 20 to 29 yrs. Old. Mean age was 36.4 and age ranged 15 to 60 yrs.

**SEX DISTRIBUTION :-**

In our study, 64% were males and 36% were females. Male to Female ratio of (1.78:1 ). There was male predominance.

In study done by Jenq-Tzong (n=79) 58 were male (73.3%) and 21 were female (26.7%) so male to female ratio was 2.7 : 1 which was similar to our study.

In study conducted by Fazel Goudarzi (n=52), 38 were males (73 %) and 14 were female (27 %), showing male to female ratio was 2.7 : 1 which was similar to our study.

#### AMOUNT OF PARAQUAT INGESTED

In our study the degree of poisoning was assessed by number of mouthful (20 ml) of paraquat concentrate ingested i.e. <1 mouthful as mild, 1 mouthful as moderate and 2 or more as severe. Due to lack of facility, plasma paraquat levels were not done.

In our study 68% patients had severe poisoning (>20 ml), 19% had moderate poisoning (10 to 20 ml) & 13% had mild poisoning (<10 ml).

A study conducted JS Sandhu (n=17), 53% of patients had severe poisoning (>20ml), 29.4% had moderate poisoning (10 to 20 ml) 17.6% had mild poisoning which was similar to our study.

#### DURATION OF PQ INGESTION TO ADMISSION

In our study 41% of the patients were admitted within 8 hours, 34% were admitted within 8 to 24 hours and 25% were admitted after 24 hours of PQ ingestion.

#### INTENTION OF POISONING

In our study majority of the patients 95% were found with suicidal intention and 5% were accidental consumption. A study conducted by Fazel Gouearzi (n=52), 73.1% with suicidal intention, accidental consumption 26.9%. A study conducted by Sabzghabae (n=29) 100% of patients had consume PQ with suicidal intention. In study conducted by , Mohammad Derriland (n=41) 89.7% of patients had consumed with suicidal intention and remaining were accidental.

PQ consumption along with alcohol, 18% patients were found. 3% were consumed PQ mixed with OP poisoning and 1% with kerosene.

#### PRESENTING SYMPTOMS (Table 2) :

In our study the commonest symptoms were Vomiting (76%), followed by burning sensation in throat (70%), difficulty in breathing 50% and Abdominal Pain (40%). Most common clinical signs were oral ulcers 74% and icterus 43%.

A study conducted by Fazel Goudarzi (n= 52), most common symptoms were nausea & vomiting (88.5%), followed by pharyngeal congestion (82.7%) and Abdominal pain (80.8%).

In study conducted by Mohammad Derriland , the main symptoms and signs of studied patients include (53.7%), nausea and vomiting (43.9%), epigastric

Pain (36.6%), mucosal lesions of oral cavity and pharynx (85.4%), loss of consciousness as mild to moderate lethargy (9.8%), and fever (9.8%).

#### TREATMENT OFFERED

In our study all patients treated with fullers earth lavage, steroids and anti oxidants. 41% patients were undergone charcoal dialysis as they were admitted within 8 hours of PQ consumption. 20% of patients were needed Hemo dialysis as they developed significant ARF.

#### COMPLICATIONS (Table 3 & Graph 1)

In our study most common complication was ARDS (67%) followed by MODS (58%), ARF (54%) and Hepatitis (48%). Respira-

tory failure and multi organ failure were main causes of mortality. A study conducted by , Mohammad Derriland (n=41) most common complication was ARF (61%) followed by MODS (57.9%), ARDS (39%) and Hepatitis (31.7%). A study conducted by, JS Sandhu (n=17) most common complication was ARF (76.5%) followed by ARDS (53%), MODS (47%) and Hepatitis (47%) which was similarly found in our study.

#### OUTCOME (Table 4):

In our study mortality rate was 64%, 9% of patients had taken discharge against medical advice and 27% of patients recovered without sequelae

A study conducted by JS Sandhu the overall mortality was 35% with additional 24% who left against medical advice (LAMA). A study conducted by, Mohammad Derriland mortality rate was 46.4%. In our study outcome depends on amount of consumption, duration, intention and charcoal dialysis. In our study 68% of the patients >20ml, among this 56 (88.83%) patients expired, 6 survived without complications and 6 took DAMA. In our study 41% of the patients undergone charcoal dialysis among this 20 patients survived.

In our study 95% had PQ consumption with suicidal intention with 100% Mortality, 5% of patients consumed accidentally with 100% survival rate.

#### SUMMARY

In this study 100 cases of PQ poisoning were studied over a period of 18 months.

The age of the patients ranged from 14 to 85 years with mean age of 36.17 year. Male patients predominated the study, the maximum, number of cases were in the age of 21 to 30 years.

The severity and outcome of the PQ poisoning is determined by amount ingested. >20ml amount of PQ poisoning associated with high mortality (88.83%), <10ml amount of PQ consumption associated with better (84.61%) survival rate.

The majority of the patients who were admitted within 8 hrs of exposure had better prognosis.

Most common presenting symptoms were vomiting (76%) followed by burning sensation in throat (70%), difficulty in breathing (50%) and abdominal pain (40%). Commonest clinical sign were oral ulcers (74%) followed by icterus (43%).

Most common complication was ARDS (67%) followed by Multi Organ failure (58%), ARF (54%) and hepatitis (48%).

Most common cause of death was ARDS followed by Multi Organ Failure.

Charcoal dialysis having role in decreasing mortality rate as in this study 41% of patients had undergone charcoal dialysis (41%) among this (48.7%) survived.

PQ poisoning under alcohol influence mixed with alcohol (18%), OPP (3%) and others (1%) have worst prognosis.

Majority of the patients of PQ poisoning were found with suicidal intention (95%) followed by accidental consumption (5%).

27% of the patients in the study improved and got discharge without complication, 9% were discharged against medical advice and 64% were expired.

#### CONCLUSION

The mortality rate is high. Recognizing the clinical presentation

and getting history of exposure, early reference for therapeutic intervention with gastric adsorbent, charcoal dialysis, steroids and anti oxidants are critical to prevent lung damage and multi organ failure.

Most of the mortality rate due to large amount of consumption of PQ, intentional exposure, late presentation to hospital and consuming PQ under alcohol influence mixed with other poisoning.

Mostly affected people are working less young age group which is a major concern.

### RECOMMENDATIONS

The burden of paraquat exposure both intentional and accidental, is an unnecessary drain of our limited healthcare resources as the management of paraquat poisoning is at best supportive in nature as there is no known antidote.

In view of the hazardous properties of paraquat acutely toxic, potential for damaging skin and being absorbed through skin, delayed effects and absence of antidote-the (acute) hazard classification of paraquat should be reassessed by the World Health Organization on the basis of current knowledge.

There are some herbicides derived from natural plant extracts, such as pine oil or coconut oil & these all to have no (or) minimal health effect however that their relatively high initial-purchase price generally puts them out of the financial reach of small holders.

The medical and health departments should intensify the treatment, training of PQ intoxication of the elementary medical personal to reduce the CFR by early diagnosing, early eliminating the toxicant effectively with comprehensive treatment.

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