



Study of Clinical profile and Prognostic indicators in patients presenting with Paraquat Poisoning in Goa Medical College- A Retrospective Study

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ABSTRACT

Background: Paraquat is a very cheap and freely available contact pesticide widely used in India and many parts of Asia. It is highly toxic to humans. Poisoning with paraquat, which is mostly suicidal, carries a very poor prognosis as there is no specific antidote to this poison. Hence this study was conducted in Goa Medical College to determine clinical profile and the prognostic factors of patients presenting with paraquat poisoning.

Methods: This study was a retrospective observational cohort study conducted in Goa Medical College and Hospital. Information about patients admitted with oral or inhalational paraquat poisoning from January 2015 till December 2020 was obtained from Medical Records Department. Patient's data was analysed using SPSS version 13. Categorical variables were presented as absolute frequency and percentages and compared using chi square test.

Results: Total number of patients in the study were 16 of which 15 had consumed paraquat orally and one had accidental inhalational exposure. 11(68.75%) patients had acute respiratory distress of which 10(62.5%) required mechanical ventilation. 9(56.25%) patients had acute kidney injury while 6(37.5%) had hepatic toxicity. Mortality rate was 87.5%

Conclusions: Acute kidney injury and acute respiratory distress are significantly associated with mortality. Neutrophil lymphocyte ratio can be used as a useful prognostic indicator.

Keywords: Paraquat, neutrophil lymphocyte ratio, prognostic indicator

I. INTRODUCTION

Paraquat is a commonly used herbicide in many Asian countries. Chemically it is 1,1'-Dimethyl-4,4'-bipyridinium paraquat dichloride. It is a non selective, fast acting, contact herbicide and weedicide¹. It is very cheap and freely available even in remote areas of India. Paraquat is highly toxic to humans with lethal dose being 10 ml of 20% solution². On ingestion, it causes corrosive

effect on alimentary tract. Around 30% of ingested paraquat gets absorbed within 1 hour of intake and it gets accumulated in lungs and kidneys. In lungs, it causes progressive fibrosis within 3 weeks of ingestion³. Main cause of mortality is renal failure, acute respiratory distress syndrome or multi-organ failure⁴. Paraquat causes irritation on dermal exposure and on inhalation.

Goa is the smallest state of India. Goa Medical College and Hospital is the only tertiary care centre catering to the entire state as well as some parts of neighbouring states of Maharashtra and Karnataka. Most often affected patients are farmers. Reason for consumption is mostly suicidal and sometimes accidental. Treatment is mostly supportive as there is no antidote to this poison thus adding to mortality. It is difficult to measure plasma paraquat concentration in all patients due to its cost and lack of availability. Also there are no clearly defined prognostic markers. Very few studies have been done on paraquat poisoning in India in the past. Hence this study was conducted to see for the clinical profile of patients presenting with paraquat poisoning to Goa Medical College and to define prognostic markers if any.

II. MATERIALS and METHODS

This study was a retrospective observational cohort study conducted in Goa Medical College and Hospital. Prior Ethical Committee approval was obtained for this study. Case papers of patients admitted with paraquat poisoning from January 2015 till December 2020 were obtained from Medical Records Department.

Inclusion criteria

All patients who were admitted with oral or inhalational Paraquat consumption over the last 5 years

Exclusion criteria

1. Patients with multiple poison intake
2. Pregnant patients
3. Patients with dermal exposure
4. Patients with serious pre-existing systemic disorder



Information about patient’s age, amount of poison intake, mode of consumption, time of presentation to hospital after intake, vitals at admission, renal function, liver function, total counts, differential count, need for dialysis or ventilator were noted.

Statistical analysis:

Statistical analysis was performed using SPSS version 13. Categorical variables were presented as absolute frequency and percentages and compared using chi square test. p value of less than 0.05 was considered statistically significant.

III. RESULTS

Total of 16 patients were admitted with paraquat poisoning in Goa Medical college from

January 2015 to December 2020 out of which 15 had consumed paraquat orally and 1 patient had accidental inhalational exposure while spraying it in his farm. Mean age of study subjects was 43.7 years with youngest patient being 22 years of age and eldest patient being 66 years of age. 62.5% (10 patients) were males and 37.5% (6 patients) were females. Reason for consumption was suicidal in 14 patients while 2 claimed it to be accidental. 6 patients (37.5%) were referred from Sindhudurg district of Maharashtra state, 5(31.25%) patients were from North Goa district and 5 patients (31.25%) were from South Goa district. Out of the total 16 patients, two patients recovered and were discharged while the remaining 14 patients expired(mortality rate 87.5 %).

Table 1: Baseline characteristics:

Age (years)	
20 -40	10(62.5%)
40-60	5(31.25%)
>60	1(6.25%)
Gender	
Male	10(62.5%)
Female	6(37.5%)
Time of hospital presentation	
<6 hours	11(68.75%)
6-12 hours	4(25%)
>12 hours	1(6.25%)
Amount of paraquat consumed	
< 50 ml	6(37.5%)
50 – 100 ml	2(12.5%)
>100 ml	5(31.25%)
Unknown	3(18.75%)
Paraquat tongue	4(25%)
Acute lung injury	11(68.75%)
Invasive ventilation	10(62.5%)
Serum creatinine>2mg/dl	9(56.25%)
Haemodialysis	5(31.25%)
Serum bilirubin>2mg/dl	6(37.5%)
AST> 2×ULN	2(12.5%)
AST> 3×ULN	4(25%)
ALT> 2×ULN	3(18.75%)
ALT> 3×ULN	5(31.25%)

Table 2: Association of age group with mortality

Age group(years)	Mortality		Total
	Yes	No	
20-40	10	0	10
40-60	3	2	5
>60	1	0	1
Total	14	2	

pvalue 0.4



Table 3: Association of gender with mortality

Gender	Mortality		Total
	Yes	No	
Male	8	2	10
Female	6	0	6
Total	14	2	

p value 0.71

Table 4: Association of time to hospital presentation with mortality

Time to hospital presentation(hours)	Mortality		Total
	Yes	No	
< 6	10	1	11
6-12	3	1	4
>12	1	0	1
Total	14	2	

p value 0.97

Table 5: Association of amount of paraquat consumed with mortality

Amount of paraquat consumed	Mortality		Total
	Yes	No	
< 50 ml	5	1	6
50-100 ml	2	0	2
>100 ml	5	0	5
Total	12	1	

p value 0.93

Table 6: Association of Acute Lung injury with mortality

		Mortality		Total
		Yes	No	
Acute Lung injury	Yes	11	0	11
	No	0	5	5
Total		11	5	

p value 0.001

Table 7: Association of Acute Kidney Injury (AKI) with mortality

		Mortality		Total
		Yes	No	
AKI	Yes	12	0	12
	No	2	2	4
Total		14	2	

p value 0.008

Table 8: Association of hepatic toxicity with mortality

		Mortality		Total
		Yes	No	
Hepatic toxicity	Yes	8	0	8
	No	6	2	8
Total		14	2	

p value 0.13

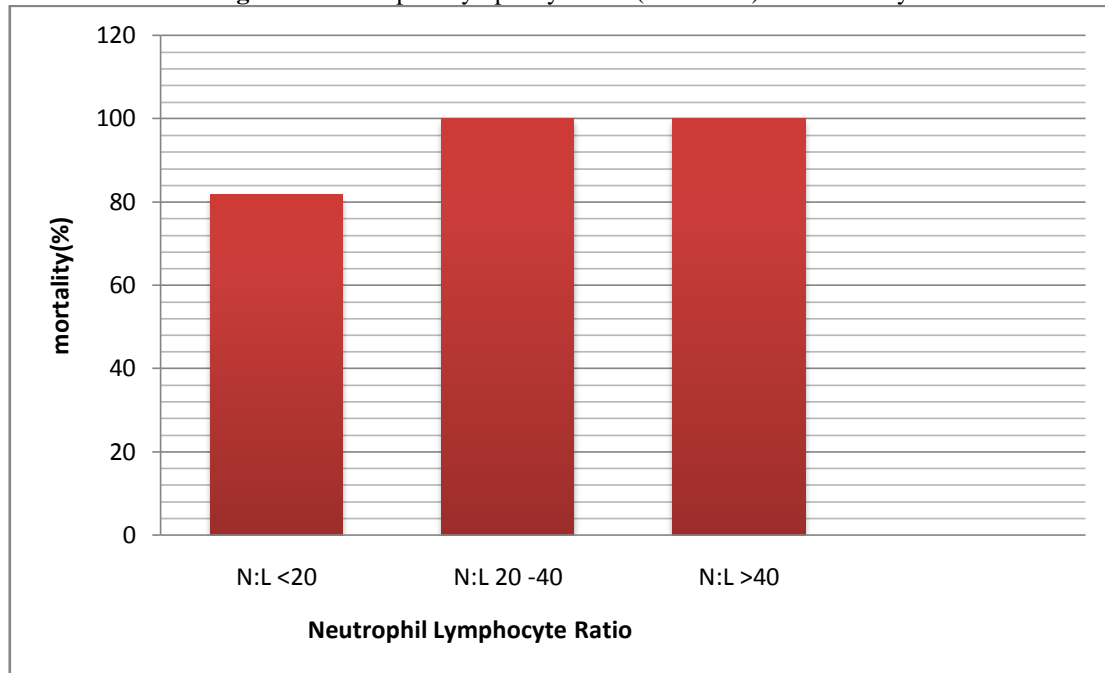


Table 9: Association of use of steroids with mortality

Steroids	Mortality		Total
	Yes	No	
Yes	4	1	5
No	10	1	11
Total	14	2	

p value 0.94

Figure 1: Neutrophil Lymphocyte ratio(N:L Ratio) and mortality



N:L<20.....mortality 81.8%

N:L>20100%

IV. DISCUSSION

Paraquat is a cheap herbicide which is widely available all over India and many parts of Asia. In our study conducted in Goa Medical College, mean age of study subjects was 43.7 yrs with more male patients compared to females. In the study conducted by Jagadeesan M. et. al.⁵ median age was 28.5 years while that in study by Kanchar et. al. it was 30 years⁶. Reason for more male patients getting admitted could be due to easy availability of paraquat in farms, more stress levels and depression among males in rural areas due to financial insecurity among farmers or underreporting of female patients with paraquat consumption due to social stigma associated with suicide in rural areas. However there was no statistically significant relationship between age group and gender with mortality.

Mortality rate in our study was 87.5%. In a study by R Ravinchandran et al.⁷ mortality rate was 72.7% while that in study by Rao et al.⁸ it was 61.4%. Reason for lower mortality in Rao et al.

study could be because those patients who were discharged against medical advice and those with delayed lung fibrosis were excluded.

Most of the patients (68.7%) presented within 6 hours of ingestion however there was no statistically significant relationship between time to hospital presentation and mortality. As in the study by Proudfoot AT et. al.⁹, mortality in paraquat poisoning correlates significantly with the amount of paraquat in blood. In our study, we could not measure blood paraquat levels as the facility was unavailable in our centre. We could not find any statistically significant correlation between amount of paraquat consumed with mortality. The reason for this could be that as the patients were brought in critical condition, they could not provide exact history of the amount consumed.

Presence of acute kidney injury and acute lung injury/acute respiratory distress at presentation was significantly related to mortality in our study. This is in accordance with the study by Roberts DM et al.¹⁰, Goudarzi et al.¹¹ and Oghabian et al.¹²



As per our study there was no significant relation between use of steroid and mortality however it is in contrast to the study by JieGao et al¹³ which showed that prolonged methylprednisolone pulse therapy was associated with reduced mortality. This difference in our study could be as a result of lower sample size in our study.

Paraquat consumption leads to remarkable increase in neutrophils and a decline in lymphocytes. This is due to pro-inflammatory cytokines like IL 6,8 and 17.^(14,15)

As plasma paraquat concentration cannot be determined easily in all centres, neutrophil lymphocyte ratio may be used as an early predictor of mortality in paraquat poisoning.⁽¹⁶⁾

V. CONCLUSION:

Paraquat is a deadly pesticide without any available antidote. It contributes to significant mortality especially among poor farmers. In our study we found that acute kidney injury and acute respiratory distress were significant predictors of mortality. Also as history on amount of poison consumed is highly unreliable in critically ill patients and as plasma paraquat levels are unavailable in many centres, markers like neutrophil lymphocyte ratio may be used as a prognostic indicator.

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CONFLICT OF INTEREST: None

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