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Nephrology

CLINICAL PROFILE AND OUTCOME OF PARAQUAT POISONING INDUCED ACUTE KIDNEY INJURY

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ABSTRACT Paraquat poisoning is one of the causes of AKI, the mechanism of toxicity being the production of reactive oxygen species, thereby causing toxicity at the cellular level. The aim of this study was to determine the requirement of haemodialysis and the severity of toxicity, depending upon the amount ingested. It was found that in Paraquat poisoning, the intervention with pre-emptive haemodialysis was not useful in decreasing the mortality. Ingestion under the influence of alcohol had higher mortality. Amount of poison ingested had a great impact and was directly proportional to the mortality. Oral ulcers, hepatic involvement, ARDS and MODS all reflected grave prognosis ultimately leading to death. The overall mortality in the study was 51%.

KEYWORDS : Paraquat Poisoning, AKI, Pre-emptive dialysis, MODS.

INTRODUCTION

Paraquat (bipyridiniums) is a toxic herbicide which acts by generation of super oxide anions, which react to form hydrogen peroxide and subsequently highly reactive hydroxyl radical. This is thought to be responsible for lipid peroxidation and cell death. These radicals have direct toxicity on the renal tubules especially the proximal segments thereby causing AKI. A second contributing factor to the toxicity is depletion of NADPH. Both hydrogen peroxide detoxification and paraquat redox cycling via glutathione are NADPH dependent. The median lethal dose LD50 is 3-5 mg/kg which is approximately 10-15 ml of 20% solution. There is no specific antidote for paraquat poisoning and the mortality rate is very high (>50%). It causes severe oral and pharyngeal ulceration, acute kidney injury, acute hepatic failure, pulmonary fibrosis ultimately MODS and death. The clinical course of paraquat poisoning depends upon the amount ingested and the time delay in hospitalization.

MATERIALS AND METHODS

In this prospective and retrospective study, all cases of paraquat poisoning, admitted at Govt Rajaji Hospital, Madurai for the past 4 years were monitored and evaluated for the development of AKI. All the patients included in the study were subjected to clinical history taking and complete physical examination. Laboratory investigations included Complete Blood Count, Coagulation Profile including Bleeding time, Clotting time, Prothrombin time, Partial Thromboplastin time, International Normalized Ratio (INR), Urine Microscopy, Urine Albumin, Renal & Liver function tests, and Serum electrolytes. Radiological investigations included X-ray chest and Ultrasonography of the abdomen. All patients were managed according to the Tamil Nadu Health Systems Project (TNHSP) guidelines. We categorized the patients into 4 groups based on the amount consumed (Group A >50 ml, Group B 30-50 ml, Group C 10-30 ml, Group D <10 ml). The need for haemodialysis is decided based on AKIN classification. The results were analysed with Chi Square test and the statistical significance evaluated.

RESULTS

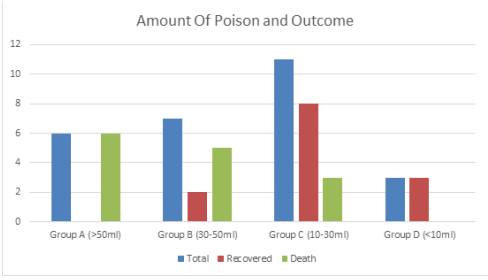
Total number of cases included in the study was 27. More common in middle aged men. The most common age group was 2nd and 3rd decade. Male to female ratio 5:1.19. 70% of the patients were illiterates and 12 patients (44%) under the influence of alcohol. Among the individuals who consumed under the influence of alcohol, 9 (65%) expired and was statistically significant (p value < 0.04). Average time of initial presentation was 4 hours (Range 1 - 88 hrs). Pre-emptive dialysis was done in 10 patients. Average time lag to pre-emptive dialysis was 22 hours. The consumption of paraquat was detected by the attenders in 12 cases (for which the average period of delay was 19 hours). This delay in diagnosis was the cause of mortality in 75% of the patients.

In Group A (6), presenting mean serum creatinine was 2.68, total patients given HD was 3 (50%) and PD was 3 (50%). Average session of HD required was 3.5, for a mean period of 3.4 days. Multi organ involvement was seen in 4 (66%), liver involvement was seen in 4 (66%) and ARDS in 5 (83%) and death occurred invariably in all patients with a mean time of 4 days. In Group B (7), presenting mean serum creatinine was 2.3, total patients given HD was 5 (66%) and PD was 2 (33%). Average HD sessions needed was 6.5, for a mean period of 5 days. Multi organ involvement was seen in 3 (40%), liver involvement was seen in 3 (42%) and ARDS in 4 (57%). Death occurred in 5 (71%) with a mean time of 5.4 days. In Group C (11), presenting mean serum creatinine was 2.86, total patients given HD was 9 (88%) and PD was 2(22%). Average sessions of HD required was 3, for a mean period of 5 days. Multi organ involvement was seen in 4 (35%), hepatic involvement was seen in 4 (36%) and ARDS in 5 (45%). Death occurred in 3 (27%) with a mean time of 5.5 days. In Group D (3), presenting mean serum creatinine was 1.7, total patients given HD was 2 (75%) and PD is 0. Average session of HD required was 2, for a mean period of 3 days with no Multi Organ involvement, liver involvement, ARDS or Death.

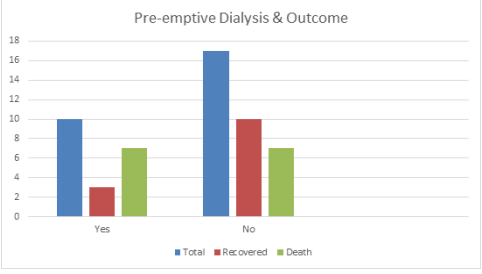
On analysis it was found that the amount consumed was the most important factor for multi organ involvement, renal failure (p value <0.003) and death (p value <0.003). On multi variate analysis, the time lag for diagnosis and the time lag for haemodialysis had no statistical significance in the outcome. Pre-emptive haemodialysis had not proven to be of significant role. Total number of death was 14 (51%) out of 27 and in that 11 have consumed more than 50 ml. Out of 17 patients who developed severe oral ulcerations, 14 (82%) patients died which was statistically significant. The occurrence of hepatitis (p value <0.04) and ARDS (p value <0.04) were associated with poorer outcomes.

PARAMETERS	Group A >50ml	Group B 30-50ml	Group C 10-30ml	Group D <10ml
Number	6	7	11	3
Alcohol intake	5	4	5	0
Avg. Time lag (hours)	2	2.3	3	6
Time lag for HD	21	22	33	19
Patients underwent HD	3	5	9	2
Serum Creatinine (mg)	2.68	2.59	2.86	1.7
Avg. HD sessions	3.5	6.5	3	2
Duration (hours)	3.4	5	5	3
PD	3	2	2	0
Oral ulcers	6	6	4	1
Hepatitis	4	3	4	0
Cardiac Involvement	0	1	1	0
ARDS	5	4	5	0
Death	6	5	3	0
Avg. Death Time (days)	4.23	5.4	5.5	0

Bar Graph 1



Bar Graph 2



DISCUSSION

Paraquat is a non-selective herbicide, contact toxin killing all green plants, branded as a moderate poison by WHO and is available in developing countries from 1960. It is toxic to humans due to its redox activity. Poisoning usually occurs through ingestion either accidentally or intentionally. Acute fulminant poisoning is characterised with multiple organ failure as discussed by Afshin Safaei Asl and et al [1]. Gastric lavage is mandatory to reduce the absorption of paraquat as stated by Cheng-Hao Weng and et al [4]. The usual course of illness will be acute renal failure, hepatic failure, respiratory failure, ultimately leading to multi organ failure and death The incidence is common in agricultural workers who have ready access to the poison. The epidemiological data on poisoning in our country is scanty as analysed by Kavitha Saravu and et al [9]. Total number cases studied was 27 which is far higher than other studies in the region. The most common age group was young males, 2nd and 3rd decade, which correlates with the previous studies where the mean age was around 20 years as stated by Malleshappa Pavan [7] and 30 years as observed by JS Sandhu and et al [8]. Among the patients included in the study, male preponderance was noted. This was similar to the previous studies by Maniappan and et al [2], Dr. Narendra S.S and et al [5], Su-ji Kim and et al [6], Malleshappa Pavan [7], JS Sandhu and et al [8]. Out of the 27 patients, 75% were illiterates and 44% were under the influence of alcohol. In our study, the mortality was high (65%), if the poison was taken under the influence of alcohol. There was no statistical data about alcohol intake in the previous studies. The average time of initial presentation was 4 hours (1-88 hours) in our study, (6 hours in Maniappan and et al [2], Dr. Narendra S.S and et al [5]). In our study the role of pre-emptive dialysis was of no statistical significance. Out of 27 patients, 10 patients underwent pre-emptive dialysis and 19 underwent haemodialysis. This had no alteration in the mortality of these patients. Previous study data also suggested that Paraquat was not removed by dialysis and haemodialysis was used only as a supportive measure. Thus, haemodialysis had no statistical value as stated by Malleshappa Pavan [7]. This indicated delayed presentation and the need for hemofiltration as discussed by Kavitha Saravu [9]. In the previous study, there was no direct relation between delay in hospitalization, on contrary, in our study, there was a strong correlation that the delay in hospitalization is associated with poor outcomes, 75% mortality. In the same way the amount of poison ingested was a single most important factor of great significance. This was in line with the previous studies by Dr. Narendra S.S and et al [5]. In our study the mortality was 51% as compared to 66% in the study by Maniappan and et al [2]. The presence of severe oral and pharyngeal ulceration was associated with high mortality because it indirectly depicts the amount of toxin ingested thereby the severity of poisoning. The patients who developed ARDS could not be followed up for the development of pulmonary fibrosis as they succumbed to death within the mean death time, but the incidence was high and the preventive measures to be tried were iv steroids and iv cyclophosphamide, as suggested by Dr. Narendra S.S and et al [5]. Thus, the important factors were, large amount of ingestion, delay in hospitalization, severe mouth ulcers, hepatic involvement, ARDS and MODS onset which were associated with worse outcomes.

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